



[0450-01-P]

DEPARTMENT OF ENERGY

10 CFR Parts 429 and 430

[EERE-2014-BT-TP-0034]

RIN 1904-AD46

Energy Conservation Program: Test Procedure for Clothes Dryers

AGENCY: Office of Energy Efficiency and Renewable Energy, Department of Energy.

ACTION: Final rule.

SUMMARY: On July 23, 2019, the U.S. Department of Energy (“DOE”) issued a notice of proposed rulemaking (“NOPR”) to amend the test procedure for clothes dryers. That proposed rulemaking serves as the basis for the final rule. Specifically, this final rule specifies additional detail for various provisions within the test procedures; specifies rounding requirements for all reported values; applies consistent use of nomenclature and corrects typographical errors; and removes obsolete sections of the test procedures, including an appendix in its entirety.

DATES: The effective date of this rule is [INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]. Representations made on or after [INSERT DATE 180 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER*] with respect to the energy use or energy efficiency of clothes dryers manufactured on or after January 1, 2015, must be based on testing conducted in accordance with this rule. The incorporation by reference of certain material listed in the

rule is approved by the Director of the Federal Register on [**INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER***]. The incorporation by reference of other material listed in this rulemaking was approved by the Director of the Federal Register on September 13, 2013.

ADDRESSES: The docket, which includes *Federal Register* notices, public meeting attendee lists and transcripts, comments, and other supporting documents/materials, is available for review at *www.regulations.gov*. All documents in the docket are listed in the *www.regulations.gov* index. However, some documents listed in the index, such as those containing information that is exempt from public disclosure, may not be publicly available.

A link to the docket web page can be found at *www.regulations.gov/docket?D=EERE-2014-BT-TP-0034*. The docket web page contains instructions on how to access all documents, including public comments, in the docket.

For further information on how to review the docket contact the Appliance and Equipment Standards Program staff at (202) 287-1445 or by e-mail: *ApplianceStandardsQuestions@ee.doe.gov*.

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SUPPLEMENTARY INFORMATION: DOE maintains a previously approved incorporation by reference and incorporates by reference the following industry standard into part 430:

International Electrotechnical Commission (“IEC”) Standard 62301, “Household electrical appliances-Measurement of standby power”, (Edition 2.0, 2011-01).

Copies of IEC 62301 can be obtained from the International Electrotechnical Commission webstore, by going to <https://webstore.iec.ch>.

American Standards Institute (“ANSI”)/Association of Home Appliance Manufacturers (“AHAM”) HLD-1-2010 (“AHAM HLD-1”), Household Tumble Type Clothes Dryers, approved 2010.

Copies of ANSI/AHAM HLD-1-2010 can be obtained from the Association of Home Appliance Manufacturers at 1111 19th Street NW., Suite 402, Washington, DC 20036, 202-872-5955, or go to *www.aham.org*.

For a further discussion of these standards, see section IV.N.

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I. Authority and Background

Clothes dryers are included in the list of “covered products” for which the DOE is authorized to establish and amend energy conservation standards and test procedures. (42 U.S.C. 6292(a)(8)) DOE’s energy conservation test procedures for clothes dryers are currently prescribed in the Code of Federal Regulations (“CFR”) at 10 CFR part 430, subpart B, appendix D1 and appendix D2 (“appendix D1” and “appendix D2”, respectively). The following sections discuss DOE’s authority to establish test procedures for clothes dryers and relevant background information regarding DOE’s consideration of test procedures for this product.

A. Authority

The Energy Policy and Conservation Act, as amended (“EPCA”),¹ authorizes DOE to regulate the energy efficiency of a number of consumer products and certain industrial equipment. (42 U.S.C. 6291–6317) Title III, Part B² of EPCA established the Energy Conservation Program for Consumer Products Other Than Automobiles, which

¹ All references to EPCA in this document refer to the statute as amended through the Energy Act of 2020, Pub. L. 116-260 (Dec. 27, 2020).

² For editorial reasons, upon codification in the U.S. Code, Part B was redesignated Part A.

sets forth a variety of provisions designed to improve energy efficiency. These products include clothes dryers, the subject of this document. (42 U.S.C. 6292(a)(8))

The energy conservation program under EPCA consists essentially of four parts: (1) testing, (2) labeling, (3) Federal energy conservation standards, and (4) certification and enforcement procedures. Relevant provisions of EPCA specifically include definitions (42 U.S.C. 6291), test procedures (42 U.S.C. 6293), labeling provisions (42 U.S.C. 6294), energy conservation standards (42 U.S.C. 6295), and the authority to require information and reports from manufacturers (42 U.S.C. 6296).

The testing requirements consist of test procedures that manufacturers of covered products must use as the basis for (1) certifying to DOE that their products comply with the applicable energy conservation standards adopted under EPCA (42 U.S.C. 6295(s)), and (2) making representations about the efficiency of those products (42 U.S.C. 6293(c)). Similarly, DOE must use these test procedures to determine whether the products comply with any relevant standards promulgated under EPCA. (42 U.S.C. 6295(s))

Federal energy efficiency requirements for covered products established under EPCA generally supersede State laws and regulations concerning energy conservation testing, labeling, and standards. (42 U.S.C. 6297) DOE may, however, grant waivers of Federal preemption for particular State laws or regulations, in accordance with the procedures and other provisions of EPCA. (42 U.S.C. 6297(d))

Under 42 U.S.C. 6293, EPCA sets forth the criteria and procedures DOE must follow when prescribing or amending test procedures for covered products. EPCA provides that any test procedures prescribed or amended under this section shall be

reasonably designed to produce test results which measure energy efficiency, energy use or estimated annual operating cost of a covered product during a representative average use cycle or period of use and shall not be unduly burdensome to conduct. (42 U.S.C. 6293(b)(3))

EPCA also requires that, at least once every 7 years, DOE evaluate test procedures for each type of covered product, including clothes dryers, to determine whether amended test procedures would more accurately or fully comply with the requirements for the test procedures to not be unduly burdensome to conduct and be reasonably designed to produce test results that reflect energy efficiency, energy use, and estimated operating costs during a representative average use cycle or period of use. (42 U.S.C. 6293(b)(1)(A)) If the Secretary determines, on his own behalf or in response to a petition by any interested person, that a test procedure should be prescribed or amended, the Secretary shall promptly publish in the *Federal Register* proposed test procedures and afford interested persons an opportunity to present oral and written data, views, and arguments with respect to such procedures. The comment period on a proposed rule to amend a test procedure shall be at least 60 days and may not exceed 270 days. In prescribing or amending a test procedure, the Secretary shall take into account such information as the Secretary determines relevant to such procedure, including technological developments relating to energy use or energy efficiency of the type (or class) of covered products involved. (42 U.S.C. 6293(b)(2)) If DOE determines that test procedure revisions are not appropriate, DOE must publish its determination not to amend the test procedures. DOE is publishing this final rule in satisfaction of the 7-year review requirement specified in EPCA. (42 U.S.C. 6293(b)(1)(A))

In addition, EPCA requires that DOE amend its test procedures for all covered products to integrate measures of standby mode and off mode energy consumption into the overall energy efficiency, energy consumption, or other energy descriptor, unless the current test procedure already incorporates the standby mode and off mode energy consumption, or if such integration is technically infeasible. (42 U.S.C. 6295(gg)(2)(A)) If an integrated test procedure is technically infeasible, DOE must prescribe separate standby mode and off mode energy use test procedures for the covered product, if a separate test is technically feasible. (*Id.*) Any such amendment must consider the most current versions of the IEC 62301³ and IEC Standard 62087⁴ as applicable. (42 U.S.C. 6295(gg)(2)(A))

B. Background

DOE's test procedures for clothes dryers manufactured on or after January 1, 2015 appear at appendix D1 and appendix D2. Manufacturers must use either appendix D1 or appendix D2 to show compliance with the applicable energy conservation standards, and must use a single appendix for all representations, including certifications of compliance.

In its most recent test procedure rulemaking for clothes dryers, DOE published a final rule on August 14, 2013 ("August 2013 Final Rule"), amending the clothes dryer test procedure, in which it (1) amended appendix D1 to update the reference to the latest edition of IEC Standard 62301, "Household electrical appliances—Measurement of

³ IEC 62301, *Household electrical appliances—Measurement of standby power*. (Edition 2.0, 2011-01).

⁴ IEC 62087, *Methods of measurement for the power consumption of audio, video, and related equipment* (Edition 3.0, 2011-04).

standby power,” Edition 2.0 2011-01 (“IEC Standard 62301”);⁵ (2) amended appendix D and appendix D1 to clarify the cycle settings used for the test cycle, the requirements for the gas supply for gas clothes dryers, the installation conditions for console lights, the method for measuring the drum capacity, the maximum allowable weighing scale range, and the allowable use of a relative humidity (“RH”) meter; and (3) established a new appendix D2 that includes procedures reflecting the amendments discussed above as well as testing methods for measuring the effects of automatic cycle termination. 78 FR 49608. (For additional background on the rulemaking history for clothes dryer test procedures, please refer to the August 2013 Final Rule).

DOE published a notice of public meeting (“NOPM”) on October 23, 2014 (“October 2014 NOPM”), and held the public meeting on November 13, 2014 to facilitate a discussion among interested parties about potential changes to the DOE clothes dryer test procedures to produce test results that measure energy use during a representative average use cycle without being unduly burdensome to conduct.⁶ 79 FR 63336.

On July 23, 2019, DOE published a NOPR (“July 2019 NOPR”) proposing amendments to the test procedures for clothes dryers to provide additional direction in response to questions from manufacturers and test laboratories. 84 FR 35484. DOE also proposed amendments to: (1) specify rounding requirements for all reported values; (2) apply consistent use of nomenclature and correct typographical errors; and (3) remove obsolete sections of the test procedures, including appendix D. *Id.* DOE also requested comment from interested parties on issues such as consumer usage patterns and

⁵ IEC Standard 62301 is available online at <https://webstore.iec.ch/publication/6789>.

⁶ A transcript of the public meeting and submitted comments are available in the docket for this rulemaking at www.regulations.gov/docket?D=EERE-2014-BT-TP-0034.

“connected” clothes dryer features. *Id.* The July 2019 NOPR also announced a webinar to be held on August 14, 2019, and stated that DOE would hold a public meeting to discuss the proposals if one was requested by August 6, 2019. *Id.*

On July 29, 2019, DOE received a comment from the Northwest Energy Efficiency Alliance (“NEEA”), the Natural Resources Defense Council (“NRDC”), and Pacific Gas and Electric Company (“PG&E”) requesting that DOE hold an in-person public meeting regarding the proposed amendments to the clothes dryers test procedures.⁷ On August 2, 2019, DOE issued a pre-publication *Federal Register* notification announcing a public meeting and webinar to be held on August 28, 2019, and cancelled the previously announced webinar scheduled for August 14, 2019. 84 FR 39777.

On August 2, 2019, and August 5, 2019, DOE received subsequent comments from the AHAM requesting to move the webinar and public meeting into September 2019.⁸ On August 21, 2019, DOE published a notification in the *Federal Register* changing the public meeting from August 28, 2019, to September 17, 2019, and extending the public comment period for submitting comments and data on the July 2019 NOPR by 14 days to October 7, 2019. 84 FR 43529.

On September 20, 2019, DOE received a comment from NEEA, NRDC, and PG&E requesting an additional 60-day comment period extension.⁹ DOE extended the comment period by 30 days to November 6, 2019. 84 FR 52817 (October 3, 2019).

⁷ See document number 17 within docket EERE-2014-BT-TP-0034, available on www.regulations.gov.

⁸ See document numbers 18 and 19 within docket EERE-2014-BT-TP-0034, available on www.regulations.gov.

⁹ See document number 22 within docket EERE-2014-BT-TP-0034, available on www.regulations.gov.

DOE received comments in response to the July 2019 NOPR from the interested parties listed in Table II.1.

Table II.1 Written Comments Received in Response to July 2019 NOPR

Commenter(s)	Reference in this Final Rule	Commenter Type
Appliance Standards Awareness Project, American Council for an Energy-Efficient Economy, Alliance to Save Energy, Natural Resources Defense Council, Consumer Federation of America, National Consumer Law Center	Joint Commenters	Efficiency Organizations
California Energy Commission	CEC	Efficiency Organization
Consortium for Energy Efficiency	CEE	Efficiency Organization
National Resources Defense Council	NRDC	Efficiency Organization
Northwest Energy Efficiency Alliance	NEEA	Efficiency Organization
Association of Home Appliance Manufacturers	AHAM	Trade Association
BSH Home Appliances Corporation	BSH	Manufacturer
GE Appliances, a Haier Company	GEA	Manufacturer
Samsung Electronics America	Samsung	Manufacturer
Whirlpool Corporation	Whirlpool	Manufacturer
Pacific Gas and Electric, Southern California Edison, San Diego Gas and Electric	California IOUs	Investor-Owned Utilities (“IOUs”)

Note: DOE received other comments outside the scope of the July 2019 NOPR and therefore are not addressed in this final rule.

II. Synopsis of the Final Rule

In this final rule, DOE amends appendix D1 and appendix D2, both entitled “Uniform Test Method for Measuring the Energy Consumption of Clothes Dryers,” to provide additional detail in response to questions from manufacturers and test laboratories, including additional detail regarding the testing of “connected” models, dryness level selection, and the procedures for maintaining the required heat input rate for

gas clothes dryers; additional detail for the test procedures for performing inactive and off mode power measurements; specifications for the final moisture content (“FMC”) required for testing automatic termination control dryers; specification of a narrower scale resolution for the weighing scale used to determine moisture content of test loads; and specification that the test load must be weighed within 5 minutes after a test cycle has terminated. In addition, DOE amends the test procedures to update the estimated number of annual use cycles for clothes dryers; provide further direction for additional provisions within the test procedures; specify rounding requirements for all reported values; apply consistent use of nomenclature and correct typographical errors; remove obsolete sections of the test procedures, including appendix D; and update the reference to the applicable industry test procedure to the version certified by ANSI.

DOE’s actions are summarized in Table II.2 and addressed in detail in section III of this final rule.

Table II.2 Summary of Changes in the Amended Test Procedure

Previous DOE Test Procedure	Amended Test Procedure	Attribution
Does not explicitly address the required configuration for network-connected functionality	Specifies that clothes dryers with connected functionality shall be tested with the network-connected functions in the “off” position if it can be disabled by the end-user; otherwise test in the factory default setting	Response to test laboratory comment
Silent on selection of the middle dryness level setting for clothes dryers with an even number of settings	Specifies using either the next-highest setting above or next-lowest setting below the midpoint if an even number of discrete settings are provided	Response to test laboratory comment
Provides adjustments that can be made to maintain the required heat input rate for gas clothes dryers	Specifies the order of adjustment, from least burdensome to most burdensome, for adjustments that can be made to maintain the required heat input rate for gas clothes dryers	Response to test laboratory question
Does not specify how quickly a test load must be weighed after a test cycle has terminated	Specifies that test load must be weighed within 5 minutes after a test cycle has terminated	Response to NOPR comments to improve repeatability and reproducibility
Specifies the use of a spray bottle for achieving the initial moisture content in appendix D2 only	Specifies the use of a spray bottle for achieving the initial moisture content in both appendix D1 and appendix D2	Response to NOPR comments

Previous DOE Test Procedure	Amended Test Procedure	Attribution
Specifies weighing scale resolution of 0.2 ounces (0.01 pounds) to determine moisture content of test loads	Specifies a narrower weighing scale resolution of 0.001 pounds to determine moisture content of test loads	Response to NOPR comments to improve repeatability and reproducibility
Uses the term “moisture content” to refer to several different measurements of moisture content throughout testing	Defines new terms “initial moisture content” and “final moisture content” to differentiate moisture content measurements during testing and calculations	Response to NOPR comments
Estimates the number of annual use cycles for clothes dryer as 283, based on 2005 survey data, for the purposes of calculating the per-cycle standby mode and off mode energy consumption calculation	Updates the estimate to 236 clothes dryer cycles per year in appendix D2, based on the latest available 2015 survey data	Response to industry comment
Requires distinction between standby mode and off mode based on control panel functionality that may not be readily apparent to a third-party tester	Provides specific procedures for measuring the low-power modes of a clothes dryer based on observable characteristics of the controls	Response to test laboratory comment
Does not explicitly provide the FMC requirement for subsequent test runs if the prior run was deemed invalid	Specifies that the requirement to achieve a final dryness level of 2 percent or less also applies to any subsequent run, if required	Response to industry comment
Does not include instructions for calculating annual operating cost, combined energy factor “CEF”, and other measures for clothes dryers optionally tested using appendix D2; does not include a calculation for annual energy consumption	Adds instructions for calculating annual operating cost and CEF using appendix D2; adds annual energy consumption calculation using either appendix D1 or D2	To provide consistency between appendices D1 and D2
Does not specify rounding requirements for reported values	Specifies rounding requirements for all reported values	To further specify reporting requirements
Contains nomenclature and formatting inconsistencies and typographical errors	Applies consistent use of nomenclature, improves formatting, and fixing typographical errors	To improve accuracy and readability
References industry standard AHAM HLD-1-2009	Updates reference to the ANSI-certified version of AHAM HLD-1-2009, ANSI/AHAM HLD-1-2010	Harmonization with industry standard

The Director of the Federal Register previously approved the following standard from IEC for incorporation by reference into appendix D1 and appendix D2: IEC 62301, “Household electrical appliances-Measurement of standby power”, (Edition 2.0, 2011-01). The Director of the Federal Register approved the following standard from AHAM for incorporation by reference into appendix D1 and appendix D2: ANSI/AHAM HLD-1-2010, “Household Tumble Type Clothes Dryers.”

As described in section III.G of this document, DOE has determined that the amendments described in section III and adopted in this document, other than the amendment to the number of annual use cycles in appendix D2, will not substantively alter the measured efficiency of clothes dryers, and that the test procedures will not be unduly burdensome to conduct. The amendment to the number of annual use cycles specified for calculating per-cycle standby mode and off mode energy consumption would alter the measured energy efficiency of clothes dryers when using appendix D2, but use of the amended value in appendix D2 is not required until such time as DOE were to amend the energy conservation standards accounting for such changes in the test procedure, should such amended energy conservation standards be adopted. Discussion of DOE's actions are addressed in detail in section III of this document.

The effective date for the amended test procedures adopted in this final rule is 30 days after publication of this document in the *Federal Register*. Representations of energy use or energy efficiency of clothes dryers must be based on testing in accordance with the amended test procedures beginning 180 days after the publication of this final rule. Manufacturers must use the test procedures in either appendix D1 or appendix D2 to demonstrate compliance with the current energy conservation standards for clothes dryers. Manufacturers must use a single appendix for all representations for a given model, including certifications of compliance, and may not use appendix D1 for certain representations and appendix D2 for other representations for that model.

III. Discussion

A. Scope of Coverage

DOE's clothes dryer test procedures are applicable to both electric and gas clothes dryers. DOE regulations define "electric clothes dryer" and "gas clothes dryer" similarly as a cabinet-like appliance designed to dry fabrics in a tumble-type drum with forced air circulation, with blower(s) driven by an electric motor(s) and either electricity or gas, respectively, as the heat source. 10 CFR 430.2. DOE did not propose to amend the scope of applicability of DOE's clothes dryer test procedures in the July 2019 NOPR. 84 FR 35484, 35487 (July 23, 2019).

AHAM agreed with DOE's proposal to not change the scope of applicability of DOE's clothes dryer test procedures. (AHAM, No. 33 at p. 2)¹⁰ DOE received no other comments on the scope of the test procedure.

DOE is not amending the scope of applicability of DOE's clothes dryer test procedures in this final rule.

B. Definitions

Section 1.13 of appendix D1 and section 1.14 of appendix D2 define the term "moisture content" as the ratio of the weight of water contained by the test load to the bone-dry weight of the test load, expressed as a percent. Throughout appendix D1 and appendix D2, the term "moisture content" is used in some instances to refer to the moisture content of the wet load (*i.e.*, before initiating the drying cycle), whereas in other instances the term is used to refer to the moisture content of the dry load (*i.e.*, immediately after completion of the drying cycle). AHAM suggested using distinct

¹⁰ A notation in the form "AHAM, No. 33 at p. 2" identifies a written comment: (1) made by the Association of Home Appliance Manufacturers; (2) recorded in document number 33 that is filed in the docket of this test procedure rulemaking (Docket No. EERE-2014-BT-TP-0034) and available for review at www.regulations.gov; and (3) which appears on page 2 of document number 33.

terms and associated acronyms to clarify the difference. Specifically, AHAM suggested the following:

Initial moisture content (“IMC”) means the ratio of the weight of water with the damp test load (prior to drying cycle) to the bone-dry weight of the test load, expressed as a percent.

Final moisture content (“FMC”) means the ratio of the weight of water with the final test load (after drying cycle) to the bone-dry weight of the test load, expressed as a percent. (AHAM, No. 33 at p. 11)

DOE has determined that adding definitions for “initial moisture content” and “final moisture content” will appropriately distinguish the relevant moisture content terms throughout both appendix D1 and appendix D2. This change in nomenclature does not substantively change the test procedure in appendix D1 or appendix D2. DOE is therefore amending appendix D1 and appendix D2 to adopt these definitions, with non-substantive wording changes to maintain consistent phrasing with the current definition of “moisture content.” Additionally, DOE uses the adopted terminology and acronyms throughout this final rule to provide clarity.

C. Test Setup

1. “Connected” Clothes Dryers

Numerous “connected” clothes dryer models are currently on the market from multiple major manufacturers. These products offer wireless network connectivity to enable features such as remote monitoring and control via smartphone, as well as demand

response features¹¹ available through partnerships with a small number of local electric utilities. DOE observes there are currently a variety of implementations of these connected features (*i.e.*, wireless hardware, connection setup, and wireless control and programming features) across different brands, and that the design and operation of these features is continuously evolving as the market continues to grow for these products.

If connected features on a clothes dryer affect its standby mode power consumption in the as-shipped configuration (*e.g.*, by energizing a wireless communication chip on the circuit board by default), such impact would have been measured by the previous test procedure provisions in section 3.6 of appendix D1 and appendix D2 for measuring standby mode and off mode power. Whereas, if the standby power consumption is not affected unless the consumer actively enables the connected functionality on the unit, any incremental standby power consumption resulting from the connected features would not have been measured by the prior test procedure, because the test procedure did not include instructions for activating any such features before performing the standby mode and off mode measurement. Similarly, any incremental energy consumption in active mode, or any other modes of operation impacted by the product's connected features, would not have been measured as part of the prior DOE test procedure, because the test cycle requirements within section 3.3 of appendix D1 and appendix D2 did not include instructions for activating any such features before performing the active mode drying cycle measurements.

To ensure the repeatability and comparability of test results between models, especially those with connected functionality, DOE proposed in the July 2019 NOPR to

¹¹ "Demand response features" refers to product functionality that can be controlled by the "smart grid" to improve the overall operation of the electrical grid, for example by reducing energy consumption during peak periods and/or shifting power consumption to off-peak periods.

specify in section 3.3 of appendix D1, and sections 3.3.1 and 3.3.2 of appendix D2, that units with network capabilities be tested with the network-connected functions disabled throughout testing. 84 FR 35484, 35493–35494 (July 23, 2019).

AHAM supported DOE’s proposal to conduct testing with connected features in the “off” position. AHAM noted that connected features operate with different capabilities and many have energy saving benefits to consumers. AHAM further commented that connected appliances can play a critical role in increasing the energy efficiency of the grid and can be used by utilities to increase demand response by peak load shifting as well as facilitate increased penetration of renewable sources of power. AHAM also stated that connected features are currently in the early stages of development, and meaningful data are currently unavailable on consumer use of connected features, as there has been limited market penetration. AHAM cautioned that regulating energy consumption associated with connected features could stifle this area of innovation and its potential energy savings benefits, stating that it is not yet fully known how consumers will use connected functionality and which features will be permanently available. Finally, AHAM noted that testing in the “off” position would be consistent with the refrigerator/freezer test procedure and asserted that doing so would recognize that this category of products is still developing, as is consumers’ use and understanding of them. (AHAM, No. 33 at p. 8)

Whirlpool commented that incremental standby power consumption resulting from connected features should not be measured when the consumer is actively required to enable connected functionality (*i.e.*, connected functionality is not enabled in the as-shipped configuration). Whirlpool also asserted that if a connected feature is enabled in the as-shipped position but can be optionally disabled by the consumer with the provided

manufacturer instructions, the feature should be disabled before testing. Whirlpool further commented, however, that if there is no means to power off the energized component that enables connected functionality, nor manufacturer instructions for powering it off, then this energy consumption should be measured. (Whirlpool, No. 32 at pp. 3–4)

The California IOUs, CEC, the Joint Commenters, and NEEA opposed testing clothes dryers with network-connected functions in the “off” position. (California IOUs, No. 29 at p. 20; CEC, No. 31 at p. 4; Joint Commenters, No. 34 at pp. 2–3; NEEA, No. 38 at p. 17)

The California IOUs commented that the ENERGY STAR qualified product list features five models sold in the United States that are certified as having connected features, and that Consumer Reports have tested approximately 50 clothes dryers with connected features—including 32 percent of the top 25-rated electric and gas standard-size clothes dryers and the top two compact-size clothes dryers—with the top three recommended dryers costing less than \$800 having connected capabilities. The California IOUs stated that with this market penetration and the overall innovation and growth in the “Internet of Things” market, capturing the network-connected function energy usage is important. (California IOUs, No. 29 at p. 20)

CEC commented that if DOE requires network-connected functions to be in the “off” position for testing, the test procedure would fail to require measurement of energy consumption of these features, which may contribute significantly to standby mode and off mode energy consumption. Furthermore, CEC stated that DOE would have insufficient information to properly consider future energy conservation standard

requirements for standby mode, as required by 42 U.S.C. 6295(gg), and adequate information may not be provided to consumers, depriving them of choice. (CEC, No. 21 at p. 4)

The Joint Commenters stated that without a measurement of network mode power consumption, consumers would have no information about the additional energy use associated with the connected functionality. The Joint Commenters encouraged DOE to measure the energy associated with network-connected functionality in order to better represent the energy consumption of connected clothes dryers. The Joint Commenters also noted that such a measurement would not impede innovation, since any amended standard could account for the additional energy use associated with network mode. (Joint Commenters, No. 34 at pp. 2–3)

While a number of connected clothes dryers are on the market with varying implementations of connected features, DOE is not aware of any data available, nor did interested parties provide any such data, regarding the consumer use of connected features. Therefore, DOE is unable to establish a representative test configuration for assessing the energy consumption of connected functionality for clothes dryers during an average period of use.

Furthermore, as noted, while DOE's prior test procedure did not explicitly require the measurement of energy use associated with any connected features, the previous test procedure, in its required measurement of standby mode and off mode power, may have captured the energy used by features that provide connected functionality. Specifically, any energy use of such connected features may have been measured in section 3.6 of appendix D1 and appendix D2 if manufacturers' instructions specify that the features be

turned on, or if the connected functionality is enabled by default when the unit is powered on. If, however, a manufacturer does not provide such an instruction, and the product ships with connected features disabled, then such energy consumption would not have been measured under the prior test procedures.

Therefore, to ensure the repeatability and comparability of test results between models, especially those with connected functionality, DOE is adopting the July 2019 NOPR proposal regarding the network-connected function setting position. DOE is also providing additional detail on the direction to “disable” the network function during testing. The direction adopted in this final rule provides further specification that a network function is to be disabled as capable by the end user pursuant to instructions provided in the product’s user manual.

DOE has determined that if network functionality cannot be disabled by the consumer and the manufacturer’s user manual does not provide instruction for disabling the function, including the energy consumption of the enabled network function is more representative than excluding the energy consumption associated with the network function.

As such, in this final rule DOE is amending section 3.3 of appendix D1, and sections 3.3.1 and 3.3.2 of appendix D2, to provide that for units with network capabilities, the network settings must be disabled throughout testing if such settings can be disabled by the end-user and the product’s user manual provides instructions on how to do so. Further, the amendments explicitly provide that if network settings cannot be disabled by the end-user, or the product’s user manual does not provide instruction for

disabling network settings, then the unit must be tested with the network settings in the factory default configuration for the test cycle.

Finally, CEE noted that its specification for clothes dryers includes optional connected criteria, which are designed to recognize units that enable new benefits to customers and the grid or energy systems in a diverse range of regulatory conditions (*e.g.*, load delay, load reduction, and energy reporting). CEE stated that connected products promoted with ratepayer funds should offer multiple pathways to connect, including an open, nonproprietary means for connecting within the physical bounds of the customer's home (*i.e.*, without requiring the use of a manufacturer's “cloud”). CEE stated further that these key elements that need to be addressed are dependent on the pending ENERGY STAR test method to validate demand response being developed by DOE. CEE encouraged DOE to finalize the ENERGY STAR test method as soon as possible and stated that CEE is relying on manufacturer written submissions that stipulate compliance with the CEE connected criteria until the test method becomes available. (CEE, No. 27 at pp. 3–4)

DOE notes that this final rule addresses only whether network-connected functions are disabled during testing under appendix D1 and appendix D2, and does not address testing the demand response functionality of any such features. DOE further notes that this final rule is separate from the process under ENERGY STAR for validating demand response.

2. Dryness Level Selection for Automatic Termination Control Dryers

Section 3.3.2 of appendix D2 states that where the dryness level setting can be chosen independently of the program, it shall be set to the “normal” or “medium” dryness

level setting. If such designation is not provided, then the dryness level is set at the mid-point between the minimum and maximum settings. DOE has received inquiries from third-party test laboratories regarding clothes dryers that have dryness settings such that a single mid-point between the minimum and maximum settings is not available (*e.g.* a clothes dryer with four dryness settings).

In the July 2019 NOPR, DOE proposed to specify in section 3.3.2 of appendix D2 that if an even number of discrete settings are provided, either the next-highest setting above the mid-point, in the direction of the maximum dryness setting, or the next-lowest setting below the mid-point, in the direction of the minimum dryness setting, is selected. 84 FR 35484, 35497 (July 23, 2019).

AHAM supported DOE's proposal to specify in appendix D2 that if an even number of discrete settings are provided, the next-highest setting above the mid-point, in the direction of the maximum dryness setting, or the next lowest setting below the mid-point, in the direction of the minimum dryness setting should be used. (AHAM, No. 33 at p. 9)

The California IOUs, Joint Commenters, Energy Solutions on behalf of the California IOUs (“Energy Solutions”), and NEEA recommended that DOE require that for clothes dryers that provide an even number of discrete settings that can be chosen independently of the drying program, the dryness level should be set to the next highest level above the mid-point between the minimum and maximum setting. (California IOUs, No. 29 at pp. 20–21; Energy Solutions, Public Meeting Transcript, No. 23 at p.

45¹²; Joint Commenters No. 34 at p. 3; NEEA, Public Meeting Transcript, No. 23 at pp. 45–46)

The California IOUs provided examples of two types of control panel configurations in which an even number of discrete dryness settings are provided. In one type, the clothes dryer includes a “damp” or very low dryness setting, for which the product manual identifies “dry” as the “normal dryness setting”, which is one step above the mid-point. In the second type, the clothes dryer includes a four-step scale from “less” to “more” dry. The California IOUs further commented that in NEEA’s 2014 Dryer Field Study,¹³ (“2014 NEEA field study”), the “less dry” setting was used only 1 percent of the time, while “normal” and “more dry” were chosen 65 percent and 34 percent of the time, respectively. Based on this, the California IOUs stated that selecting the next highest setting from the mid-point would best represent an average use cycle for a clothes dryer with an even number of discrete dryness settings. (California IOUs, No. 29 at pp. 20–21) Energy Solutions commented that when four (or an even number of) settings are provided, typically the lowest is an air-dry feature that provides no additional drying, such that the order is air dry, low, medium, and high. Energy Solutions stated that the intention is not to have the setting set to low dryness (*i.e.*, the next-lowest setting from the mid-point); but rather, the intention is to have the setting set to medium (*i.e.*, the next-highest setting). (Energy Solutions, Public Meeting Transcript, No. 23 at p. 45)

¹² A notation in the form “Energy Solutions, Public Meeting Transcript, No. 23 at p. 45” identifies an oral comment that DOE received on September 17, 2019 during the public meeting, and was recorded in the public meeting transcript in the docket for this test procedure rulemaking (Docket No. EERE–2014–BT–TP–0034). This particular notation refers to a comment (1) made by Energy Solutions during the public meeting; (2) recorded in document number 23, which is the public meeting transcript that is filed in the docket of this test procedure rulemaking; and (3) which appears on page 45 of document number 23.

¹³ The 2014 NEEA field study surveyed clothes dryer usage patterns of 50 households in the Pacific Northwest region. The report is available in the docket for this rulemaking at: www.regulations.gov/document?D=EERE-2014-BT-TP-0034-0010.

NEEA asserted that using the next-highest setting would reduce test burden, as it would decrease the likelihood that the clothes dryer would be unable to reach the required remaining moisture content requirement and thus need to be retested. Further, NEEA commented that DOE should removing ambiguity by providing definitive guidance one way or the other, rather than allowing the laboratory to select either the next-highest or next-lowest setting. (NEEA, Public Meeting Transcript, No. 23 at pp. 45–46)

BSH recommended that if a clothes dryer's controls have an even number of dryness level settings and therefore do not have a mid-point that can be selected, the dryness level should be set at the next-lower set point below the mid-point. (BSH, No. 30 at pp. 3–4)

As stated, the previous test procedure did not provide direction as to the setting to select if the clothes dryer provides an even number of dryness settings, none of which are labeled as “normal” or “medium.” To address testing of a clothes dryer with such a configuration, DOE is adopting the direction as proposed. The direction to select either the next-highest setting above the mid-point, or the next-lowest setting below the mid-point, preserves the flexibility of manufacturers to assign the number and dryness level of settings available on a unit. For example, a manufacturer may assign the second of four settings as the selection most closely equivalent to the “normal” dryness setting. In such an instance, it would not be appropriate to require selecting the next-highest above the mid-point. Additionally, a manufacturer would not be able to select a setting that did not achieve a valid test cycle (*i.e.*, an FMC of 2 percent or less, as required by section 3.3.2 of appendix D2, which is representative of the consumer-accepted dryness level, as described further in section III.D.1.e.iii of this document). As such, a manufacturer would not be able to select the next-lowest setting below the mid-point if such setting did

not provide the necessary dryness level. Furthermore, while the 2014 NEEA field study presents a percentage of cycle usage by dryness setting, the data are limited to three dryness settings (“less dry”, “normal”, and “more dry”) and therefore do not provide insight into the frequency of dryness settings selected for clothes dryers with an even number of cycle dryness settings.

Given the considerations above, DOE is amending section 3.3.2 of appendix D2 to state that either the next-highest dryness setting above the mid-point or the next-lowest dryness setting below the mid-point may be tested. Section 3.4.7 of appendix D2 (which is not amended by this final rule) requires recording for each test cycle the cycle settings selected, in accordance with section 3.3.2 of appendix D2. The certification reporting requirements for clothes dryers at 10 CFR 429.21(b)(2) require a certification report to include, for products tested using appendix D2, a list of the cycle setting selections for the energy test cycle as recorded in section 3.4.7 of appendix D2. This reporting requirement is unchanged by this final rule. DOE notes that the settings used for appendix D2 certification are publicly available through DOE’s compliance certification database.¹⁴

3. Drum Capacity Measurement

Section 3.1 of appendix D1 and appendix D2 requires measurement of drum capacity by filling the drum with water and using the weight of water in the drum to determine the drum volume. Clothes dryer drum capacity is reported by manufacturers in cubic feet (10 CFR 429.21(b)(2)) and is used to distinguish between compact-size and

¹⁴ DOE’s compliance certification database for appendix D2 is available at www.regulations.doe.gov/certification-data/CCMS-4-Clothes_Dryers_-_Appendix_D2.html.

standard-size clothes dryer product classes. See appendix D1, sections 1.6 and 1.16; appendix D2, sections 1.7 and 1.17.

a. Alternative Drum Capacity Measurement Method

NEEA suggested that, to reduce test burden, the current drum measurement approach could be replaced with the tape measurement method used in a draft California Commercial Tumble Dryer Test Protocol.¹⁵ NEEA described this method as taking physical measurements with a standard tape measure and calipers, and using a formula to compute the volume. NEEA noted that although the tape measurement method is expected to be less precise than the water measurement method, precision is less important, in NEEA's opinion, when drum capacities clearly fall within the range for compact-size or standard-size product classes. NEEA further proposed that the water measurement method could be retained for clothes dryers with drum volumes that are near the product class drum volume threshold. Finally, NEEA stated that the current water measurement method completed by a third-party laboratory can cost up to \$500 to perform. (NEEA, No. 38 at p. 17)

Upon reviewing the draft California Commercial Tumble Dryer Test Protocol, DOE noted that the tape measurement/caliper method suggested by NEEA is only used to measure drum capacities for commercial clothes dryers with drum volumes greater than 9.5 cubic feet according to the California Commercial Tumble Dryer Test Protocol. Under the California draft, a water volume measurement method, similar to that in the DOE test procedures at appendix D1 and appendix D2, would still be required for clothes dryers with reported drum capacity less than 9.5 cubic feet. Nonetheless, DOE investigated the accuracy and effectiveness of the California Commercial Tumble Dryer

¹⁵ California Commercial Tumble Dryer Test Protocol 2017 proposal;
<https://efiling.energy.ca.gov/GetDocument.aspx?tn=219983&DocumentContentId=26567>.

Test Protocol tape measurement/caliper method for consumer clothes dryers, particularly those with rated drum capacities less than 9.5 cubic feet, by comparing the drum capacity resulting from the tape measurement/caliper method to the rated drum capacity, which is determined based on the water volume drum capacity approach in the DOE test procedures. DOE conducted the tape measurement/caliper method of the California Commercial Tumble Dryer Test Protocol on three compact-size and two standard-size clothes dryers, and compared the resulting values to the rated drum capacity. The results of this investigation are presented in Table III.1.

Table III.1 Drum Capacity Measurement Investigation

Test Unit	Rated Drum Capacity (ft ³)	Measured Drum Capacity (ft ³)	Percent Difference
1	2.8	2.67	-4.5%
2	3.6	3.63	0.7%
3	4.0	3.87	-2.8%
4	5.1	5.13	0.6%
5	7.4	7.32	-1.1%

The results in Table III.1 show a range of differences between the two methods (from -4.5 percent to +0.6 percent), which DOE attributes to the inherently less precise nature of the California Commercial Tumble Dryer Test Protocol, including the inherent variability in measuring irregular contours within the drum. Under the California Commercial Tumble Dryer Test Protocol, test technicians are instructed to approximate any irregular volumes. The tape measurement/caliper method from the California Commercial Tumble Dryer Test Protocol is designed for measuring the capacity of larger drums associated with commercial clothes dryers, for which the variability in approximating irregular volumes has lesser relative impact on drum capacity measurements; however, for smaller consumer clothes dryers, these approximations may have more significant impacts on reported drum capacity.

The results of the tape measurement/caliper method investigative testing demonstrate that the draft California Commercial Tumble Dryer Test Protocol could yield capacity measurement values that differ by up to 5 percent from the current drum capacity measurement method in the DOE test procedures. While a difference of this magnitude could potentially be acceptable for large-capacity clothes dryers that are clearly above the 4.4 cubic foot threshold that differentiates the standard and compact consumer clothes dryer product classes, further investigation and analysis would be required to better understand the implications of using the tape measurement/caliper method for consumer clothes dryers, and to determine the range of capacities for which the tape measurement/caliper method could be appropriate for use as an alternative to the water volume drum capacity approach. DOE does not have sufficient information at this time with which to implement such an alternative capacity measurement method. Therefore, DOE is not amending appendix D1 and appendix D2 at this time to include a tape measurement method for determining consumer clothes dryer drum capacity.

b. Drum Capacity Measurement Water Temperature

The clothes dryer test procedures do not specify a temperature for the water used in the drum capacity test. AHAM proposed that DOE establish water temperature requirements in appendix D1 and appendix D2 that align with section 3.1.4 of the clothes washer test procedure located in 10 CFR part 430, subpart B, appendix J2 (“appendix J2”), which requires either 60 degrees Fahrenheit (“°F”) ± 5 °F (15.6 degrees Celsius (“°C”) ± 2.8 °C) or 100 °F ± 10 °F (37.8 °C ± 5.5 °C) water. (AHAM No. 33 at p. 12)

DOE recognizes that water density varies based on water temperature. Section 3.1.6 of appendix J2 specifies using a water density of 62.3 pounds per cubic foot (lb/ft³) for 60 °F water or 62.0 lb/ft³ for 100 °F water. For the clothes washer test procedure,

specifying the temperature of the water is necessary because the volume of the clothes container must be determined to the nearest 0.01 cubic feet for the purpose of determining test load sizes. (Section 3.1.7 of appendix J2) Whereas, DOE is not aware of any instance, and commenters have provided none, in which this degree of precision is required for the clothes dryer test procedure. For this reason, DOE is not amending appendix D1 and appendix D2 to specify the water temperature during the drum capacity test.

4. Test Room Conditions

Section 2.2.1 of appendix D1 and appendix D2 specify maintaining the test chamber ambient air temperature at 75 ± 3 °F and a room RH of 50 ± 10 percent.

The California IOUs and AHAM recommended that DOE tighten the tolerances for ambient temperature and humidity to improve repeatability of testing results. (California IOUs, No. 29 at pp. 12–13; AHAM, No. 33 at p. 12) The California IOUs referenced clothes dryer testing conducted by PG&E in 2019¹⁶ (“2019 PG&E testing”), for which three models were tested according to appendix D2 with the ambient conditions maintained at an average of 75 °F and 50 percent RH (corresponding to the nominal test conditions specified by appendix D2), with additional tests performed at an average of 72.4 °F and 57 percent RH (remaining within the specified tolerances of appendix D2). The California IOUs noted that for the three models tested, the two models with the lowest CEF results under the 75 °F and 50 percent RH test conditions switched rank order when tested at 72.4 °F and 57 percent RH. (California IOUs, No. 29 at pp. 12–13)

¹⁶ Test results from the 2019 PG&E testing are referenced in the California IOUs comment in the docket for this rulemaking at: www.regulations.gov/document?D=EERE-2014-BT-TP-0034-0029.

AHAM asserted that operating at either end of the current humidity level tolerance range can significantly impact drying performance. AHAM proposed tightening the tolerances on these requirements as follows: room ambient air temperature to 75 ± 2 °F and room RH to 50 ± 5 percent. AHAM suggested that this adjustment would not increase test burden because test laboratories are already capable of maintaining the tighter tolerances. (AHAM, No. 33 at p. 12)

GEA supported all requests for tighter tolerances in the AHAM comments. GEA stated that its laboratories are currently able to maintain the tolerances suggested by AHAM without additional test burden or cost, and that GEA does not have any information indicating other laboratories would not be able to obtain these same levels of precision with little to no additional cost or burden. (GEA, No. 37 at p. 2)

DOE notes that the relevant 2019 PG&E testing was limited to three units, which is an insufficient sample of units to demonstrate a quantifiable and representative trend across all units on the market. AHAM did not provide any data in support of its comment on this issue. DOE does not have sufficient data at this time to justify making any changes to the ambient conditions specified in the test procedure. Further testing would be required on a broader, more representative selection of units in order to assess whether reducing the temperature and humidity tolerances would provide more repeatable test results. For these reasons DOE is not making any changes to the currently specified temperature and humidity tolerances at this time.

Section 2.2.1 of appendix D1 and appendix D2 specifies maintaining the room RH at 50 ± 10 percent. BSH suggested that the current RH tolerance in appendix D1 and appendix D2 could be interpreted as either 10 percent of 50 (*i.e.*, a 5 percent RH range—

45 percent to 55 percent) or a 10 percent RH range (*i.e.*, 40 percent to 60 percent). BSH recommended that DOE specify maintaining the room RH between the limits of 45 percent to 55 percent. (BSH, No. 30 at p. 3)

The RH specification requires maintaining RH in the range of 40 percent to 60 percent. DOE notes that when it initially established the clothes dryer test procedure in a final rule published on September 14, 1977, section 2.2 of appendix D stated, “Maintain the...room relative humidity at 40 percent to 60 percent relative humidity.” 42 FR 46145, 46150.¹⁷ To address the potential for misinterpretation identified by BSH, DOE is amending how the RH requirement is described in the test procedures by specifying to maintain the room RH at 50 percent \pm 10 percent RH. This clarification is consistent with the previous test procedure and does not constitute a change to that test procedure.

5. Maintaining Burner Rating for Gas Clothes Dryers

Section 2.3.2.1 of appendix D1 and appendix D2 requires that natural gas clothes dryers maintain the hourly British thermal unit (“Btu”) rating of the burner during testing to within \pm 5 percent of the hourly Btu rating specified by the manufacturer.¹⁸ Section 2.3.2.2 of appendix D1 and appendix D2 provides analogous requirements for propane clothes dryers. The requirement to maintain the hourly Btu rating of the burner provides repeatable test conditions, recognizing that the rate of heat input into a clothes dryer can significantly affect its performance. These sections provide instructions regarding tolerances and adjustments that can be made to the inlet gas pressure,¹⁹ gas pressure

¹⁷ DOE revised how the relative humidity specification was presented in appendix D (*i.e.*, presenting the specification as “50 \pm 10 percent”) in a final rule published May 19, 1981, but stated that the substance of the requirement was not being amended. *See* 46 FR 27324, 27325.

¹⁸ The hourly Btu rating of a gas clothes dryer is typically specified on the product’s nameplate sticker.

¹⁹ For natural gas clothes dryers, section 2.3.2.1 of appendix D1 and appendix D2 specifies maintaining the gas supply pressure immediately ahead of all controls within a range of 7 to 10 inches of water column. For propane clothes dryers, section 2.3.2.2 of appendix D1 and appendix D2 specifies maintaining the gas supply pressure immediately ahead of all controls within a range of 11 to 13 inches of water column.

regulator setpoint,²⁰ and/or modifications to the orifice²¹ in order to maintain the hourly Btu rating within ± 5 percent of the rating specified by the manufacturer.

If the required hourly Btu rating cannot be achieved under the allowable range in gas inlet pressure, the prior test procedures provided instruction for modifying the orifice of the gas burner as necessary (*i.e.*, adjustments to the gas inlet pressure should be made before considering modifications to the orifice). However, the large majority (if not all) of clothes dryers currently on the market include a gas pressure regulator, which is situated between the gas inlet and the orifice. Since the purpose of a gas pressure regulator is to provide a constant output pressure regardless of fluctuations in upstream supply pressure, adjusting the gas inlet pressure upstream of a pressure regulator will typically have no impact on the pressure of the gas exiting the regulator and entering the orifice, or likewise the hourly Btu rating.

To provide further direction applicable to the large majority of gas clothes dryers on the market that include a gas pressure regulator, in the July 2019 NOPR, DOE proposed an order of adjustment for maintaining the hourly Btu rating within specification as follows: (first) adjust the supply gas pressure, (second) adjust the pressure regulator setpoint, or (third) modify the orifice as necessary. 84 FR 35484, 35494 (July 23, 2019). The proposed order specifies using an approach with the least amount of test burden necessary to achieve the specified test conditions. This order also

²⁰ For both natural gas and propane clothes dryers, if the clothes dryer is equipped with a gas appliance pressure regulator for which the manufacturer specifies an outlet pressure, the regulator outlet pressure must be maintained within ± 10 percent of the value recommended by the manufacturer in the installation manual, on the nameplate sticker, or wherever the manufacturer makes such a recommendation for the basic model.

²¹ The orifice is an attachment that typically screws into the outlet of the gas pressure regulator and has a small-diameter outlet hole, through which the gas flows into the burner. For both natural gas and propane clothes dryers, the test procedures provide for modifying the orifice of the gas burner as necessary if the required hourly Btu rating cannot be achieved under the allowable range in gas inlet pressure.

corresponds to the least amount of modification to the unit that would be necessary to achieve the specified test conditions. Adjusting the supply gas inlet pressure requires no modifications to the clothes dryer itself. Adjusting the pressure regulator setpoint typically requires removing an access panel on the clothes dryer and tightening or loosening a screw on the regulator. Modifying the orifice typically requires removing an access panel on the clothes dryer, disassembling the burner, removing the orifice, modifying the orifice (*e.g.*, by drilling a larger-diameter outlet hole), reinstalling the orifice, and finally reassembling the burner.

In DOE's testing experience, any deviation of the hourly Btu rating beyond ± 5 percent of the rated value can be remedied with a minor adjustment to the gas pressure regulator (within the allowable range of ± 10 percent of the recommended pressure level). Based on DOE's experience with third-party test laboratories, preferentially starting with the least burdensome adjustments before trying progressively more burdensome adjustments is generally consistent with industry practice.

In the July 2019 NOPR, DOE proposed to provide this direction in a new section 2.3.2.3 in both appendix D1 and appendix D2, which would apply to both natural gas and propane clothes dryers. In conjunction, DOE proposed simplifying the existing provisions within sections 2.3.2.1 and 2.3.2.2 to reduce duplication with provisions that would be included in the new section 2.3.2.3, and therefore improve the overall readability of the test procedures.

NEEA supported specifying the order of specification for adjustment; however, NEEA urged DOE to remove the third proposed option to physically modify the gas orifice. NEEA suggested that in its experience, such modifications are not included in

installation manuals supplied with the product, and physically modifying the orifice may produce test results that would not be representative of the manufactured product as installed in the field. (NEEA, No. 38 at p. 17) NEEA further suggested that the test procedure should specify test conditions that are achievable, and that if a unit is unable to stay within those parameters, modification would need to occur on the manufacturing side rather than as the responsibility of the testing technician to physically modify the product. (NEEA, Public Meeting Transcript, No. 23 at pp. 27–30, 40–41)

AHAM supported DOE's proposal, stating that it is consistent with current best laboratory practice, would clarify and simplify the test procedure, would codify the method that has long been used to test clothes dryers, and is needed to ensure test conditions can be met throughout the test. AHAM also stated that if these three steps are not permitted, the test will become unduly burdensome to conduct. In addition, AHAM explained that providing for adjustment of the orifice represents a balance among test burden and the accuracy, repeatability, and reproducibility of the test. (AHAM, No. 33 at p. 8; AHAM, Public Meeting Transcript, No. 23 at pp. 29–32)

The purpose for adjustment of the orifice during testing is to ensure that the performance of the clothes dryer is representative of performance at the Btu rating specified by the manufacturer on the product's nameplate, which informs the field installation conditions. Allowing for adjustment of the orifice reduces test burden and improves repeatability by providing test laboratories with a last resort to maintain the hourly Btu rating as specified by the manufacturer. As stated in the July 2019 NOPR proposal, modification of the burner orifice shall be used as the last choice for maintaining the hourly Btu rating. 84 FR 35484, 35494 (July 23, 2019).

Based on all the available information, including the experience of DOE, industry, and laboratories with testing, and to ensure the test is repeatable with minimal test burden as discussed in the preceding paragraphs, DOE is amending the test procedure as proposed in the July 2019 NOPR to provide the order of the existing provisions that shall be taken to maintain the hourly Btu rating within ± 5 percent of the rating specified by the manufacturer.

6. Gas Pressure Tolerance and Measurement

Section 2.3.2.1 of appendix D1 and appendix D2 requires that the natural gas supply pressure must be maintained between 7 to 10 inches of water column ahead of all controls for all gas clothes dryers using natural gas. The hourly Btu rating of the gas burner must be maintained within ± 5 percent of the rating specified by the manufacturer, and the natural gas supplied must have a heating value of approximately 1,025 Btu per standard cubic foot. The actual heating value must be obtained by use of a standard continuous flow calorimeter described by section 2.4.6 of appendix D1 and appendix D2, or by the purchase of bottled natural gas whose Btu rating is certified to be at least as accurate as that obtained by use of a standard continuous flow calorimeter.

GEA suggested that the current gas input pressure tolerance of between 7 and 10 inches water column (“WC”) may create unreasonable variance in the test outcomes. GEA noted that while a range may be necessary to reach the rated Btu/hr of a unit for testing, the procedure should be amended to reduce variability where possible. Referencing the process set forth in ANSI Standard Z21.5.1-2017, “Gas Clothes Dryers, Volume I, Type 1 Clothes Dryers,” GEA recommended that DOE adopt 7 inches WC as the target with a maximum of 10 inches WC in its gas clothes dryer test procedures.

GEA further suggested that the range for the target Btu/hour during testing should be the nominal rating of the appliance ± 2.5 percent rather than the currently specified ± 5 percent, noting that the current range allows for a 10-percent variation in Btu/hr, which is a key measure used to determine energy usage by gas clothes dryers. GEA stated that the current range allows too much variability in testing results. According to GEA, the proposed tighter range would not increase test burden. (GEA, No. 37 at p. 3)

DOE is unaware of any data that suggests either the current gas input pressure tolerance or the current tolerance of ± 5 percent of hourly Btu rate produces unrepresentative or unrepeatable test results. GEA did not provide any such data. In addition, as discussed previously, the large majority of (if not all) clothes dryers currently on the market include a gas pressure regulator, which is situated between the gas inlet and the orifice. Adjusting the gas inlet pressure upstream of a pressure regulator will typically have no impact on the pressure of the gas exiting the regulator, or likewise the hourly Btu rating. Absent data or other information demonstrating an issue with the current natural gas supply conditions, DOE is not amending these provisions.

GEA further commented that gas flow meters vary by manufacturer and type and described the wide variation in different types of meters. GEA suggested that given the wide range of issues and error that can be introduced by the wide variability in gas flow meters, DOE should specify type and capacity standards for the type of gas flow meter to be used for the gas clothes dryer test procedures. (GEA, No. 37 at pp. 3–4) GEA further noted that the gas heating value (“GEF”) specified in the procedures for gas clothes dryers must be corrected according to the U.S. Bureau of Standards, circular C417, 1938 (as specified in section 3.4.6.3 of appendix D1 and appendix D2), which requires a series

of correction and conversion factors. GEA commented that the calculations and corrections vary according to calorimeter equipment instructions, type of gage flow meter used, and may be influenced by gas supply pressure, barometric pressure, gas temperature, and gas absolute pressure (“psia”). GEA suggested that all formulas and measurements used in making GEF calculations should be clearly specified in the DOE gas clothes dryer procedures, and that this missing information increases test uncertainty and creates reproducibility and reliability issues for the DOE verification program.

(GEA, No. 37 at p. 4)

Additionally, GEA commented that the Heat Input Test (required in sections 2.3.2.1 and 2.3.2.1 of appendix D1 and appendix D2) is an essential part of determining the hourly Btu rating in the appendix D1 and appendix D2 test procedures for gas clothes dryers, but there is currently no specified procedure on how the Heat Input Test is to be performed. GEA requested that DOE develop a procedure for the heating input test to determine the Btu/hr of the clothes dryer under test, and that the procedure should include requirements for load size, load wetness, clothes dryer cycle selection, clothes dryer run time, and gas flow verification during the measurement period. GEA asserted that this would resolve various issues, including the need to account for the time for gas flow to begin after cycle start, the change in input rate over time for the first several minutes of burner operation, and the potential for burner cycling during the Heat Input Test. GEA recommended that DOE review the procedure in ANSI Z21.1-2016/CSA 1.1-2016, “Household Cooking Gas Appliances” (“ANSI Z21.1-2016/CSA 1.1-2016”), which specifies that measurements not be taken until 5 minutes after burner ignition to account for variation in flow rate caused by heat effects on the equipment. GEA also recommended that the Heat Input Test be performed with a DOE test cloth load wetted in the same fashion as done for the primary energy consumption test, to ensure that the

burner in the clothes dryer is running for the complete measurement time during the Heat Input Test. (GEA, No. 37 at pp. 4–5)

DOE understands that test laboratories do not all use the same gas flow meters; however, DOE is unaware of data or other information suggesting any substantive variation in test results due to the use of different gas flow meters. DOE also reviewed ANSI Z21.1-2016/CSA 1.1-2016 and determined that for the purposes of measuring the hourly Btu rating for gas clothes dryers, the products that are the subject of that test standard differed too widely in use and purpose from clothes dryers to warrant direct application of testing provisions to appendix D1 and appendix D2. Although DOE does not currently specify a particular procedure for measuring the Btu firing rate of the burner, DOE is unaware at this time of any data that would suggest a significant variation in test results associated with different methods of measuring the hourly Btu rating for gas clothes dryers. GEA did not provide any such data. For these reasons, DOE is not specifying type and capacity standards for the gas flow meter in appendix D1 and appendix D2, and is not specifying a procedure to use for determining the Btu firing rate of the gas clothes dryer burner at this time.

Were DOE to become aware of data on any of the topics covered in this section, DOE would consider such data in a future evaluation of the clothes dryer test procedure as appropriate.

7. Water Conductivity

The DOE test procedure does not specify a requirement for water conductivity, which is a measurement of the water's ability to conduct electric current and is expressed in microsiemens per centimeter (“ $\mu\text{S}/\text{cm}$ ”). The California IOUs suggested that while the

reproducibility of the appendix D2 test procedure is reasonable, variations due to water conductivity need to be addressed to ensure reproducible test results. The California IOUs presented test data from the 2019 PG&E Testing showing measured CEF as a function of water conductivity for six clothes dryer models. Each model was tested multiple times, and the data indicates the measured CEF value and measured water conductivity for each test. Two of the models demonstrated a positive correlation (*i.e.*, CEF increased as water conductivity increased), whereas four of the models showed either negative correlation or no significant correlation between water conductivity and CEF. The California IOUs also presented an analysis of the repeatability of the measured CEF values from one of the models in the PG&E test sample and concluded that reproducibility improves when water conductivity is controlled. (California IOUs, No. 29 at pp. 7–9)

The California IOUs stated that water hardness and water conductivity can be controlled independent of one another and have naturally occurring variances around the United States. The California IOUs suggested that water conductivity can play an important role in how effective a clothes dryer’s automatic cycle termination feature operates, particularly for a common automatic cycle termination method that uses moisture sensing bars to calculate the moisture content of the load. *Id.*

The California IOUs urged DOE to explore this variable further. The California IOUs suggested the DOE test procedure require testing at multiple water conductivity levels or incorporate the impact of this variable through other means in order to encourage manufacturers to address potential CEF variability due to water conductivity and thereby improve CEF reproducibility and repeatability. (California IOUs, No. 29 at pp. 5–12)

To address these comments, DOE conducted investigative testing exploring the effects of water conductivity on the measured CEF value. DOE tested a sample of six consumer clothes dryers representing a range of product classes and efficiency levels, varying the water conductivity between 0 $\mu\text{S}/\text{cm}$ (*i.e.*, distilled water) and 800 $\mu\text{S}/\text{cm}$ (*i.e.*, the maximum safe level in accordance with the water quality standards cited by the California IOUs in their comment). The water used to saturate the test cloth was prepared using distilled water with added table salt (sodium chloride), sufficient to achieve the desired conductivity, confirmed using a conductivity meter. Each of the six test units was tested three times according to appendix D2, saturating the test cloth in successive tests with water having a conductivity level of 0 $\mu\text{S}/\text{cm}$ (distilled), 400 $\mu\text{S}/\text{cm}$, and 800 $\mu\text{S}/\text{cm}$. Figure III.1 presents the CEF values from the three tests for each of the six units tested at varying levels of water conductivity, additionally including results from previous testing using tap water. DOE estimated the conductivity of its tap water as 130 $\mu\text{S}/\text{cm}$, based on an average of multiple measurements on different test days.

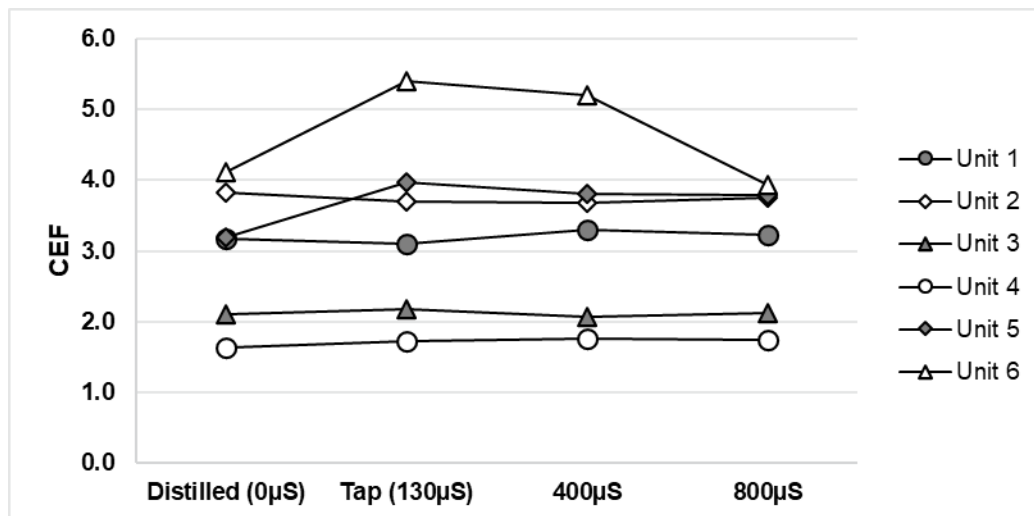


Figure III.1 CEF at Different Water Conductivity Levels

The results shown in Figure III.1 indicate no discernable correlation between CEF and water conductivity, with minimal change in CEF overserved for Units 1 through 4.

Unit 6 exhibited a substantially higher CEF at 130 $\mu\text{S}/\text{cm}$ and 400 $\mu\text{S}/\text{cm}$, while Unit 5 demonstrated a lower CEF for only the distilled water test; in neither case, however, did the trend in CEF correlate consistently with water conductivity. DOE's data suggest that CEF is not directly related to water conductivity, as there is no predictable or consistent correlation between CEF and water conductivity.

Similarly, the test results submitted by PG&E also showed inconsistent correlations between CEF and water conductivity (*i.e.*, in some cases a positive correlation, in some cases a negative correlation, and in other cases no clear correlation), and limited evidence from a single clothes dryer model suggesting that controlling for water conductivity may lead to more repeatable or reproducible results. (California IOUs, No. 34 at pp. 9–12) DOE appreciates the information regarding water conductivity and its potential effect on repeatability and reproducibility of the test procedure. However, the data provided by commenters and additional data obtained through DOE's investigative testing do not definitively suggest any clear and predictable correlation between water conductivity and measured efficiency, and thus, do not indicate that including a specification in the test procedure for water conductivity would improve the repeatability or reproducibility of the test results. For these reasons, DOE is not adopting a water conductivity requirement in this final rule.

D. Test Conduct

1. Test Conditions and Consumer Usage Patterns

DOE received various comments in response to the July 2019 NOPR regarding testing conditions in the DOE clothes dryer test procedure. The following sections discuss these issues and changes to the DOE clothes dryer test procedure.

a. Test Load Size

Section 2.7 of appendix D1 and appendix D2 specifies a test load weight of 8.45 pounds \pm .085 pounds for standard-size clothes dryers (*i.e.*, with a drum capacity of 4.4 cubic feet or greater) and a test load weight of 3 pounds \pm .03 pounds for compact-size clothes dryers (*i.e.*, with a drum capacity of less than 4.4 cubic feet).

NEEA, the California IOUs, Joint Commenters, CEC, NRDC, and Samsung urged DOE to include additional load size testing, with priority given to small load sizes. These commenters generally stated that small loads represent a large percentage of clothes dryer cycles in the field and result in lower measured efficiency compared to the required load sizes. These commenters asserted that adding a smaller load size to the test procedure would make the test more representative, and the efficiency ratings more useful, for consumer purchasing decisions. The details of each comment are presented as follows, including discussion of data sources and each commenter's assertions. (NEEA, Public Meeting Transcript, No. 23 at pp. 90, 101–104, 105–107, 112–113; California IOUs, Public Meeting Transcript, No. 23 at pp. 104–105, 139–144; CEC, Public Meeting Transcript, No. 23 at pp. 150; Joint Commenters No. 34 at pp. 1–2; NRDC, No. 35 at p. 2; Samsung, No. 36 at p. 3)

i. 2014 NEEA Field Study

NEEA and the California IOUs cited the 2014 NEEA field study as justifying the use of an additional half-size test load. NEEA commented that the 2014 NEEA field study and recent national market research conducted by the California IOUs suggest that typical load sizes vary widely, but that small loads represent 20 to 40 percent of all loads. The California IOUs cited from the 2014 NEEA field study that the 8.45-pound test load specified in appendix D1 and appendix D2 for standard-sized clothes dryers is close to

the average weight of “simple loads²²” (7.87 pounds), but the most common load weights were smaller, with 40.5 percent of loads being less than 6.5 pounds. The California IOUs also referenced the 2014 NEEA field study in commenting that clothes drying performance at the average load size is not predictive of performance at small load sizes. The California IOUs and NEEA suggested that a test load half the size of the DOE-specified load could capture the reduced clothes dryer performance with small-size loads and would produce a more representative efficiency ranking order for clothes dryers. NEEA suggested that small loads result in less energy efficient performance due to higher relative startup energy, lower cloth surface area, reduced contact of the cloth with the moisture sensing strips, and reduced effectiveness of using the measured exhaust temperature to assess the remaining moisture content. NEEA also suggested that consumers may separate garments from the washer into multiple drying loads, resulting in more clothes dryer loads per year than washer loads, with each clothes dryer load being smaller, on average. (California IOUs, Public Meeting Transcript, No. 23 at pp. 104–105, 139–144; NEEA, Public Meeting Transcript, No. 23 at pp. 90, 101–104, 105–107, 112–113)

AHAM commented that although NEEA’s data showed small clothes dryer load sizes in the Pacific Northwest, the data are not representative of national clothes dryer usage, and that clothes dryer use may differ from region to region. (AHAM, Public Meeting Transcript, No. 23 at pp. 103–104)

ii. 2019 PG&E Market Survey

²² Simple loads are defined in the 2014 NEEA field study as clothes dryer loads with the following characteristics: The load is both washed and dried; the IMC is between 33 percent and 100 percent, the bone-dry weight is between 3 pounds and 15 pounds; no items are removed between the wash and dry cycles; the dryer is not run multiple times.

The California IOUs asserted that, based on the survey of clothes dryer usage in 210 single family households conducted by PG&E in September 2019 (“2019 PG&E market survey”),²³ clothes dryer usage (including load sizes and cycle settings) does not significantly vary between seasons, with only cycle settings exhibiting some variation between the Pacific Northwest and the rest of the United States. The California IOUs commented that results for the typical clothes dryer load size showed no significant differences when comparing winter and summer load operation, while the regional differences between the Pacific Northwest and the rest of the United States were minimal. The California IOUs suggested that the results provide further context and validity to the usage patterns presented in the 2014 NEEA field study. (California IOUs, No. 29 at pp. 1–4, 13–15)

iii. Other Testing

NEEA commented that its organization tested 12 electric clothes dryer models manufactured after 2015 with both the DOE standard load and a smaller load comprised of what NEEA stated was “real clothing.” NEEA presented test data and concluded that the measured efficiency rank order among the tested models changed appreciably from the standard load size test, with the ENERGY STAR-qualified units particularly demonstrating lower efficiency with the smaller load size relative to the non-ENERGY STAR-qualified units in its sample for both electric and gas units. (NEEA, No. 38 at pp. 1–3, 9–11, 18)

The California IOUs commented that in the 2019 PG&E testing, PG&E investigated the impact of smaller load sizes on three standard-size clothes dryer models

²³ The survey respondents were asked to identify their typical dryer load size and settings in the summer (June through August) and winter (December through February) seasons.

from different brands. The California IOUs cited the results of the 2019 PG&E testing in which the efficiency rank order of the three models changed when tested with smaller loads. Based on these results, the California IOUs commented that the appendix D2 test procedure may not accurately represent drying of smaller loads. The California IOUs recommended including a smaller load size as part of the clothes dryer test procedure in order to capture the rank order and CEF variability under commonly used clothes dryer operating conditions. (California IOUs, No. 29 at pp. 1–4, 13–15)

NRDC recommended that DOE consider any updates to the IEC clothes dryer test procedure regarding smaller test load sizes, but that DOE should not wait for IEC before DOE proposes changes to the DOE test procedure. (NRDC, No. 35 at p. 2)

iv. DOE Response

DOE appreciates the data provided by the commenters regarding various study and survey results relating to the energy efficiency performance of clothes dryers when drying smaller load sizes. DOE notes that the cited studies and surveys are not conclusively representative of the entire country, given that they were limited in scope and geographic location. The 2019 PG&E market survey data did not effectively demonstrate that there were no significant differences between the Pacific Northwest and the rest of the United States in clothes dryer load size. For example, these data showed fewer “Mostly Full” loads in the Pacific Northwest (50 percent in the winter and 50 percent in the summer) than in the rest of the country (64 percent in the winter and 61 percent in the summer). The 2019 PG&E market survey data also showed more “Less Than Half Full” loads in the Pacific Northwest (25 percent in the winter and 33 percent in the summer) than in the rest of the country (18 percent in the winter and 22 percent in the summer). These differences also suggest that the results of the 2014 NEEA field study

may be too limited in geographic scope to be considered representative of the entire United States.

However, the national data collected by the 2019 PG&E market survey may better represent the United States as a whole, albeit with a relatively small sample size of 210 respondents. As presented by the California IOUs, the national sample from the 2019 PG&E market survey indicates that the relative proportion of very small loads (“Less Than Half Full”) is similar in magnitude to the relative proportion of “Very Full” loads. The data indicate that in the summer months, 22 percent of loads are less than half full, while 15 percent of loads are very full; and in the winter months, 18 percent of loads are less than half full and 16 percent of loads are very full. Given the relatively small sample size of this national consumer usage data, DOE is unable to determine at this time the representativeness of these load size distributions based on the provided information.

To supplement and better understand the results provided in comments, DOE tested seven standard-size electric clothes dryers from four manufacturers, representing a range of capacities, venting configurations, efficiency performance, and heating technologies, to investigate the impact of test load size on energy use and measured efficiency. Table III.2 provides the characteristics of each model in DOE’s test sample.

Table III.2 Characteristics of Clothes Dryers in DOE Test Sample

Test Unit	Capacity (cubic feet)	Venting Configuration	Measured CEF using Appendix D2	Heating Technology
1	7.2	Vented	2.79	Electric Resistance
2	7.0	Vented	3.15	Electric Resistance
3	7.4	Vented	3.29	Electric Resistance
4	7.4	Vented	3.36	Electric Resistance
5	7.4	Vented	3.92	Electric Resistance
6	7.4	Ventless	4.45	Heat Pump
7	5.1	Ventless	7.77	Heat Pump

For each model, DOE tested five load sizes using DOE test cloth: 3.0, 5.7, 8.45, 11.2, and 13.9 pounds. DOE conducted each test according to appendix D2, substituting the load size as noted. Figure III.2 shows the combined total energy consumed in each test cycle (corresponding to E_{CC} as calculated in section 4.6 of appendix D2) and indicates an approximately linear relationship between the weight of the test load and the per-cycle energy consumption.

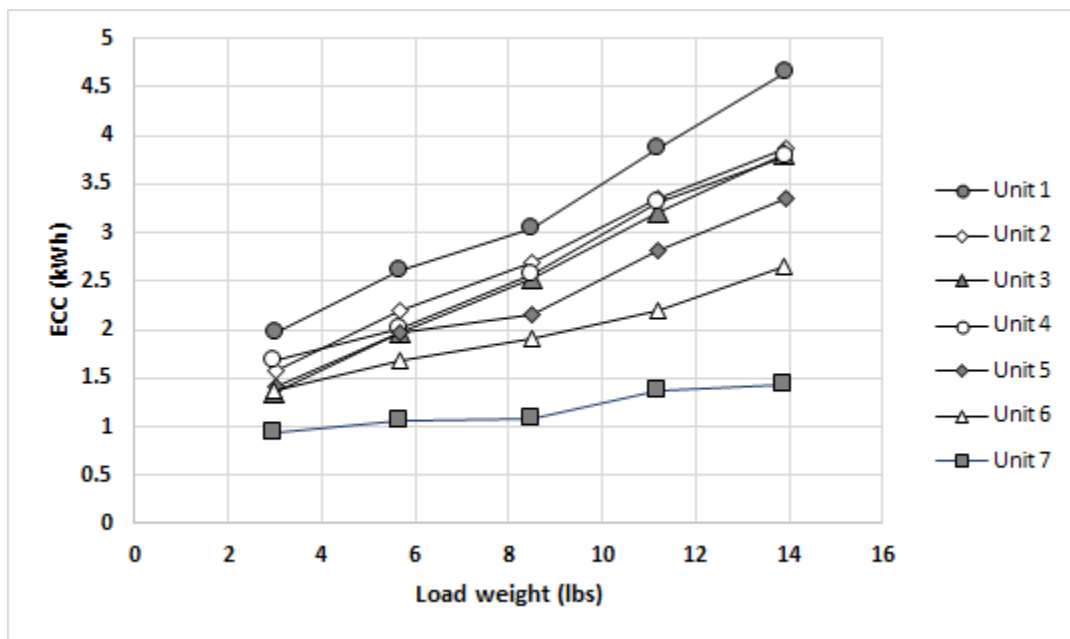


Figure III.2 Standard-Size Electric Clothes Dryer Per-Cycle Energy Consumption versus Load Size in DOE Testing

The linearity of the energy consumption relationships in Figure III.2 shows that if both a smaller load size and larger load size (in relation to the current load size) are additionally tested in order to calculate the energy consumption that is representative of an average use cycle, the lower per-cycle energy consumption associated with the smaller load size would essentially be entirely offset by the higher per-cycle energy consumption associated with the larger load size, with little net change to the resulting average per-cycle energy consumption; and thus little change to the CEF value, as compared to the

CEF value obtained from testing with the current single DOE test load size. With little expected change to the CEF value when considering the energy consumption associated with a range of load sizes, DOE does not believe the additional testing would provide consumers with improved information that would change their purchasing decisions compared to the current test procedure. As such, any incremental benefit of testing with additional load sizes would be outweighed by the significant added burden that would be imposed by conducting such tests. For these reasons, DOE is not making any amendments to the test procedure requiring additional test load sizes at this time.

b. Test Load Bone-Dry Weight

Section 2.7.1 of appendix D1 and appendix D2 specifies the process by which a test load is prepared for a compact-size clothes dryer. Specifically, it describes the target weight of 3.00 pounds \pm .03 pounds, as well as the use of energy stuffer cloths, of which up to five may be used, to achieve the tolerance required for the bone-dry test load.

Section 1.5 of appendix D1 and 1.6 of appendix D2 describe the bone-drying process.

BSH commented that for compact-size clothes dryers, for which the range of acceptable bone-dry test load weight is 3.00 pounds \pm .03 pounds, it is difficult to adjust the weight of the test load because, based on its experience, the average weight of an individual energy stuffer cloth is .037 pounds. According to BSH, this may lead to variability in test results. BSH recommended that the maximum allowable weight of the test load after the first bone-dry run should be 3.03 pounds for compact-size clothes dryer loads, and that the test load weight after every bone-dry run shall be recorded. BSH also commented that the bone-dry definition has no maximum time limit for the bone-drying process. Without an upper time limit, BSH argued it would be possible for the bone-drying process to be used to reduce the weight of heavy test loads to meet the maximum

weight limits and not solely for setting the baseline for the 2-percent FMC condition. BSH recommended that DOE require that any single bone-dry run shall not exceed 10 minutes and 15 seconds, and that no more than four bone-dry runs may be conducted for a single test load, to ensure that the bone drying process is used only to set the baseline for the 2-percent FMC. (BSH, No. 30 at pp. 2–3)

DOE is unaware of issues regarding achieving the bone-dry test weight as specified in section 1.5 of appendix D1 and section 1.6 of appendix D2, which both define “bone dry” as a condition of a load of test cloths which has been dried in a clothes dryer at maximum temperature for a minimum of 10 minutes, removed, and weighed before cool down, and then dried again for 10-minute periods until the final weight change of the load is 1 percent or less. Further, BHS did not explain how the bone-dry provisions could be used for a purpose other than establishing the bone-dry baseline. The bone-drying process is required to establish the baseline weight for the FMC condition, and setting an upper time limit to the bone-drying process as suggested by BHS could significantly increase test burden or require manufacturers to design clothes dryers with specialized drying cycles solely for achieving bone-drying specifications outside of the scope of consumer-driven needs.

Based on the preceding discussion, DOE is not amending the test procedure regarding acceptable bone-dry test load weight or the bone-drying process.

c. Test Load Composition

Section 2.6 of appendix D1 and appendix D2 specifies a test load composed of a pure finished bleached cloth, made with a momie or granite weave, which is a blended fabric of 50-percent cotton and 50-percent polyester. Appendix D1, section 2.6.1(a);

appendix D2, section 2.6.1(a). The “energy test cloth” is made from material that is 24 inches by 36 inches, hemmed to 22 inches by 34 inches, and weighs within 10 percent of 5.75 ounces per square yard. Appendix D1, section 2.6.1(b); appendix D2, section 2.6.1(b). Smaller “energy stuffer cloths” are made of material that is 12 inches by 12 inches, hemmed to 10 inches by 10 inches.²⁴ Appendix D1, section 2.6.2; appendix D2, section 2.6.2.

Several industry test procedures specify clothing loads for measuring the drying performance of clothes dryers. ANSI/AHAM’s test procedure, HLD-1-2010, “Household Tumble Type Clothes Dryers” (“ANSI/AHAM HLD-1-2010”) specifies the use of 100-percent cotton bed sheets, towels, and pillowcases. The bedsheets and pillowcases are plain weave linen, while the towels are huckaback weave. ANSI/AHAM HLD-1-2010, Annex A. IEC Standard 61121, Edition 4.0 2012-02, “Tumble dryers for household use—Methods for measuring the performance” (“IEC Standard 61121”) incorporates by reference from IEC’s consumer clothes washer test procedure two different test loads: (1) the “Cotton test load,” which comprises 100-percent cotton bed sheets, towels, and pillowcases consistent with ANSI/AHAM HLD-1-2010; and (2) the “Synthetics/blends test load,” which comprises pillowcases and buttoned men’s shirts fabricated from plain weave 35-percent cotton and 65-percent polyester fabric. IEC Standard 61121, sections 6.5.6.1–6.5.6.2.

Another procedure that uses a variety of test cloth materials is the “Utility Test Protocol”²⁵ (“UTP”) developed by NEEA and the California IOUs, which utilities and efficiency advocates have encouraged DOE to consider as a model for implementing

²⁴ The test procedure specifies that the energy stuffer cloths are to be used to adjust the test load to achieve the proper weight, but that no more than five stuffer cloths may be added per test load.

²⁵ Available at <https://neea.org/resources/energy-efficiency-test-procedure-for-residential-clothes-dryers-1>

revised test loads. (California IOUs, No. 29 at pp. 1–3) The UTP is an investigative test method that was developed based on data collected in 2012 as part of the 2014 NEEA field study. It consists of one test using the appendix D2 test procedure and four supplemental tests that use a range of test load compositions, test load sizes, and cycle settings.²⁶ The UTP generates a combined energy metric referred to as the Utility Combined Energy Factor (“UCEF”), comprised of a weighted average of each model’s energy efficiency performance on each of the five tests, using weighting factors determined by a best fit between lab and field test data.

NEEA, the Joint Commenters, and CEC urged DOE to consider adopting test loads with material more similar to real clothing, stating that cloth material has a significant impact on clothes dryer efficiency. NEEA and the Joint Commenters recommended that DOE consider adopting an optional test procedure that uses a test load with varied size, thickness, and fabric types, such as the IEC or AHAM test loads, which commenters suggested would be more representative. The Joint Commenters suggested that DOE monitor the IEC test procedure development. CEC referenced a Pacific Northwest National Laboratory (“PNNL”) study²⁷ that showed differences in load dryness and drying rate between the DOE test load and the AHAM test load. CEC stated that the AHAM test load, consisting of bed sheets, pillowcases, and hand towels, is less uniform and more challenging to dry, and that PNNL found that the AHAM test load had a higher moisture content than the DOE test load as the clothes dryer entered automatic cycle termination. NEEA emphasized the impact of test cloth material on heat-pump clothes dryer performance particularly and also stated that appendix D2 results for both

²⁶ The “Utility Test Protocol” consists of a series of five tests: (1) using the appendix D2 test method; (2) using a 4.22-pound “real-world” load with the medium temperature setting and “eco” mode deactivated; (3) using a 16.9-pound “real-world” load with the medium temperature setting and “eco” mode deactivated; (4) using an 8.45-pound “real-world” load using the most efficient setting configuration possible; and (5) using an 8.45-pound “real-world” load using settings that achieves the fastest rate of drying possible.

²⁷ TeGrotenhuis, W, PNNL, Clothes Dryer Automatic Termination Sensor Evaluation, September 2014.

high efficiency and low efficiency models aligned well with the results for test loads with using fabrics of differing weights and materials, but failed to distinguish between moderately efficient models. (NEEA, Public Meeting Transcript, No. 23 at pp. 18, 20, 22–23, 106–109, 117–118; Joint Commenters, No. 34 at p. 2; CEC, No. 31 at p. 2)

Energy Solutions commented that the thickness of the test cloth has a large impact on clothes dryer performance, regardless of type of material used. Energy Solutions suggested that DOE take cloth thickness into consideration when balancing representativeness and repeatability in the test procedure. (Energy Solutions, Public Meeting Transcript, No. 23 at pp. 21–22)

GEA commented that there is inherent variation in natural fibers of a single uniform cloth, even within specially manufactured DOE test cloth lots, that creates variability that impacts the reliability of the DOE test procedure. AHAM claimed that the summary of test data from the 2019 PG&E testing, prepared by Energy Solutions,²⁸ shows that changing the test load composition as indicated by the PG&E testing will introduce significant additional variation, beyond that of the current DOE test cloth. AHAM stated that test procedures with significant variation do not provide uniform or reliable results for the purpose of allowing consumers to make informed purchase decisions based on energy use/efficiency because the results of a highly variable test procedure are not comparable within or across brands. AHAM and GEA asserted that the 2014 NEEA field study provides an insufficient basis on which to amend the test procedure, and the concept of a “real-world” test load that would significantly increase test variation is incompatible with the requirement that test procedures be “reasonably

²⁸ PG&E Residential Dryer Testing, Residential Clothes Dryer Test Protocol Investigation, Prepared by David Jagger, Energy Solutions (Sept. 6, 2019), Docket No. EERE-2014-BT-TP-0034; RIN 1904- AD46; ID EERE-2014-BT-TP-0034-0024 (Posted Sept. 30, 2019).

designed,” in accordance with EPCA (42 U.S.C. 6293(b)(3)). AHAM also stated that data collected on test load composition and consumer use would need to be national to be representative or to inform rulemaking decisions, because clothing washed and dried varies by climate and season. Without such data, AHAM maintains that it is impossible and inappropriate to determine or change the average use/cycle in a test procedure. AHAM noted that the DOE clothes dryer test procedure, including the test load composition, is based on consumer use studies and changing the test would require showing that something has changed with regard to consumer behavior or that more accurate consumer use study data are available. AHAM asserted that the 2014 NEEA field study is not a sufficient basis upon which to make changes to the clothes dryer test procedure, namely the test load composition, given that it was conducted only in the Pacific Northwest and only during the winter season, and therefore not representative of the laundry composition of the entire nation throughout the year. (AHAM, Public Meeting Transcript, No. 23 at pp. 98–99 AHAM, No. 33 at pp. 3–4; GEA, No. 37 at p. 2)

Altering the test cloth composition would require further investigation into a suitable representative replacement. The data provided by the 2014 NEEA field study (discussed in section III.D.1.a.i of this document) are insufficiently representative to justify the significant cost of developing and transitioning to a new type of test cloth, due to the limited sample size, region, and time of year during which the studies were conducted, as discussed previously in AHAM’s comment.

As explained previously, DOE is unaware of any new information that would alter its previous determination, that testing using the IEC and AHAM test loads is less representative than testing with the DOE test load, to warrant any modifications to the DOE test procedure at this time. 78 FR 49608, 49620 (Aug. 14, 2013). DOE therefore is

not making any changes to the test cloth material requirements in appendix D1 and appendix D2 at this time.

However, in light of the feedback received regarding test load composition, DOE will continue to evaluate the representativeness of test results obtained through the use of the current test load composition requirements in the DOE test procedure. DOE will also continue to monitor development of industry standards and other efforts related to test load composition.

d. Test Cycle Selections

Section 3.3.2 of appendix D2 specifies that for automatic termination control clothes dryers, the “normal” program shall be selected for the test cycle. For clothes dryers that do not have a “normal” program, the cycle recommended by the manufacturer for drying cotton or linen shall be selected. If the drying temperature setting can be chosen independently of the program, it shall be set to the maximum. If the dryness level setting can be chosen independently of the program, it shall be set to the “normal” or “medium” dryness level setting. After the completion of the test cycle, the test load is removed and weighed. If the FMC is greater than 2 percent, the test is considered invalid and a new run shall be conducted using the highest dryness level setting.

Industry standards address cycle selection differently from the DOE test procedure. Section 4.5.1 of ANSI/AHAM HLD-1-2010 specifies that the test cycle be run using the maximum temperature setting without allowing the clothes dryer to advance into the cool down period. If the required FMC specified in the industry standard (6 percent) cannot be met using this setting, a new test run must be conducted using a different user-selected setting that will achieve the target FMC, as described in section

4.5.6 of ANSI/AHAM HLD-1-2010. IEC Standard 61121 requires that the test cycle for a given load composition be run using the cycle program and settings specified in the manufacturer's instructions to achieve a target FMC, which is based on the test load composition; in the absence of any instructions from the manufacturer, or if the specified cycle program and settings do not achieve the required FMC, the test shall be run using a user-selected combination of cycle program and settings that will achieve the required FMC, as specified in section 8.2.2 of IEC Standard 61121 .

In response to the July 2019 NOPR, NEEA, the Joint Commenters, and the California IOUs urged DOE to consider including additional test cycle selections in the test procedure. NEEA and the California IOUs suggested that DOE should capture the impact of “eco” mode settings, since they asserted that the “eco” mode settings are often only enabled by default on the “normal” cycle. The California IOUs cited the 2019 PG&E testing and reported that 15 clothes dryers among the 2019 PG&E testing sample of 22 had an “eco” mode that was active by default on the “normal” setting, but not active by default on other cycle programs. For some units, the “eco” setting was not a selectable option during a “high” or “low” temperature cycle. The California IOUs further commented that PG&E testing at an independent lab in accordance with appendix D2 with and without the “eco” mode yielded results that showed changes in CEF rank order, performance, and cycle time compared to the average when the “eco” setting is on or off. NEEA and the California IOUs recommended that DOE add additional cycle selections to the test procedure to mitigate the impact of “eco” mode settings, and NEEA stated that this should be accomplished by adding a “fast test cycle” (*i.e.*, a cycle with a shorter duration) at the standard load size. Based on the 2014 NEEA field study and another NEEA field study conducted in 2017 that looked exclusively at load sizes and settings for the most efficient clothes dryers, NEEA asserted that 20 percent to 60 percent

of all loads monitored were dried using the shortest cycle time available on the machine. NEEA and the Joint Commenters commented that heat pump clothes dryers particularly suffer efficiency losses on shorter cycle time settings, since much of their efficiency gain is obtained by drying the clothes at a lower temperature for a longer period of time, resulting in changes in efficiency rank order when a shorter cycle that uses more electric resistance heat is tested. The Joint Commenters also noted that some clothes dryers default to the most recent cycle used, which could lead to consumers not using the normal cycle for extended periods of time, meaning that testing additional cycle selections could increase representativeness. (NEEA, No. 38 at pp. 3, 12–16, 18; Joint Commenters, No. 34 at p. 2; California IOUs, No. 29 at pp. 15–16)

AHAM commented that it is unclear whether the data presented in the 2014 NEEA field study are an accurate reflection of consumer cycle settings, as the study relied on the consumers to log their data, which may not be accurate. AHAM further asserted that without knowledge of the controls of the monitored clothes dryers, it is difficult to draw conclusions regarding the frequency of cycle selections, and those cycle selections could be impacted by the type of clothing, which was potentially heavier during the winter months. AHAM asserted that the data from the 2014 NEEA field study may not be representative of consumer use across the entire United States over the course of a year and, on their own, are not a sufficient basis upon which to justify significant changes to the test procedure. (AHAM, No. 33 at p. 3)

While the comments recommending the inclusion of additional test cycle selections suggest that changing the cycle setting could change efficiency rank order, DOE did not receive sufficient data and information to confirm that the current test selections are unrepresentative of consumer use and that other or additional test selections

are warranted. DOE notes that the data presented from the 2014 NEEA field study may not be representative of annual national clothes dryer usage, and the 2019 PG&E market survey showed differences between the Pacific Northwest and the rest of the country in test cycle selections, as discussed in section III.D.a.iv of this final rule. Therefore, DOE maintains its prior determination that the “normal” cycle test in appendix D2 and the required temperature and dryness settings are appropriately representative. See 78 FR 49608, 49612–49613 (Aug. 14, 2013). For these reasons, DOE maintains the current approach of requiring a single cycle test, in section 3.3 of appendix D1 and appendix D2.

e. Moisture Content

i. Initial Moisture Content

Sections 2.7.1 and 2.7.2 of appendix D1 specify to extract water from the energy cloths for a test load for a compact-size dryer load and standard-size dryer load, respectively, so that the IMC is between 54.0 and 61.0 percent of the bone-dry weight of the test load. Sections 2.7.1 and 2.7.2 of appendix D2 specify that the IMC of energy cloths for a compact-size dryer load and standard-size dryer load, respectively, after extraction must be between 52.5 and 57.5 percent of the bone-dry weight of the test load. Appendix D2 also provides additional instruction that any final mass adjustments to achieve the specified IMC for the energy test cycle (57.5 percent \pm 0.33 percent) are made by uniformly adding water to each test cloth using a spray bottle. Appendix D2, sections 2.7.1 and 2.7.2.

AHAM recommended that the appendix D1 test load IMC (*i.e.*, 54.0 to 61.0 percent) should be aligned with that of appendix D2 (*i.e.*, 57.5 percent \pm 0.33 percent). AHAM also recommended specifying in appendix D1 the same method for test cloth IMC adjustment that is described in appendix D2 (*i.e.*, add water uniformly distributed

among all of the test clothes in a very fine spray using a spray bottle). AHAM commented that aligning the method in appendix D1 with that in appendix D2 would make it easier for test technicians who conduct both tests. AHAM also suggested that water temperature has a significant effect on drying performance, which can cause test variation. AHAM suggested that the test procedure specify that the temperature of the spray bottle water must be $60\text{ }^{\circ}\text{F} \pm 5\text{ }^{\circ}\text{F}$, with a nominal target of $60\text{ }^{\circ}\text{F}$. (AHAM, No. 33 at pp. 12–13)

Appendix D1 requires, in addition to an IMC of 54.0 to 61.0 percent (*i.e.*, $57.5\text{ percent} \pm 3.5\text{ percent}$), an FMC between 2.5 and 5.0 percent for all clothes dryers. Appendix D1, sections 2.7.1, 2.7.2, and 3.3. The measured test cycle energy consumption is then normalized to calculate the energy consumption required to dry the test load from exactly 57.5-percent IMC to 2-percent FMC, which is representative of clothes dryers currently on the market and of the maximum consumer-accepted FMC. Appendix D1, section 4.1. In the August 2013 Final Rule, DOE reduced the tolerance on the IMC to 0.33 percent to produce repeatable results specifically for clothes dryers with automatic termination controls, for which no such normalization is required, because the test cycle is run to completion. 78 FR 49608, 49618 (Aug. 14, 2013). Because appendix D1 does not specify running any test cycles to completion and instead applies normalization of the test cycle energy consumption for both timer and automatic termination control clothes dryers, the IMC requirements for appendix D1 do not require the more stringent tolerance of those in appendix D2, avoiding increased test burden associated with test load conditioning. As such, DOE is not amending the required IMC in appendix D1.

However, DOE agrees with AHAM that appendix D1 would benefit from the additional direction for adding water to the test load using a spray bottle as provided in appendix D2. The previous version of appendix D1 does not instruct what to do if the test load IMC is too low upon removing the test load from the extractor. A test laboratory may interpret, in this case, that the test load must be re-wet and re-spun until an acceptable IMC is achieved, which would add testing burden. Appendix D2 provides means to increase the IMC of such a test load in a much less burdensome manner through the use of a spray bottle.

To quantify the burden associated with test cloth preparation, DOE investigated the repeatability of the extractor to achieve a specified moisture content. In accordance with appendix D1 and appendix D2, DOE prepared three standard-size test loads and two compact-size test loads, weighed before and after the extractor cycle. For the three standard-size test loads, two test loads were prepared twice and one test load was prepared once, for a total of five extractor tests. For the two compact-size test loads, both were prepared twice, for a total of four extractor tests. The North Star Engineered Products Inc. (formerly Bock) Model 215 extractor, specified in section 3.2 of the DOE clothes washer test procedure at 10 CFR part 430, subpart B, appendix J3 (“appendix J3”), was used in this investigation, with the same extractor spin setting selected for all tests. DOE expects that this extractor is representative of typical clothes dryer testing equipment at commercial test laboratories. The IMC values of this investigation are shown in Table III.3. Note that these IMC values were recorded prior to the use of a spray bottle according to the method in appendix D2.

Table III.3 Water Extraction Results from Extractor Investigation

Extractor Test	Test Load	% IMC (No Spray Bottle Used)	Within Range Defined by Appendix D1?
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1	Standard #1	53.13%	No
2	Standard #2	55.30%	Yes
3		55.25%	Yes
4	Standard #3	54.20%	Yes
5		53.63%	No
Standard-Size Test Load Range		53.1 – 55.3%	
Appendix D1 Range		54.0 – 61.0%	
5	Compact #1	57.51%	Yes
6		56.77%	Yes
7	Compact #2	56.81%	Yes
8		57.51%	Yes
Compact-Size Test Load Range		56.8 – 57.5%	
Appendix D1 Range		54.0 – 61.0%	

For all but two test loads, the extractor produced an IMC within the range of 54.0 to 61.0 percent, as specified in appendix D1; however, two standard-size test loads had IMCs less than 54 percent (the minimum of the range defined in appendix D1). These results confirm that despite the wider range of target IMC values defined in appendix D1 compared to those in appendix D2, the extractor can sometimes lead to an IMC value lower than the target IMC range in appendix D1. Without the moisture content adjustments provided by use of a spray bottle as specified in appendix D2, the previous language of appendix D1 suggests that test loads prepared under appendix D1 may require re-wetting and re-spinning.

As summarized, DOE is amending appendix D1 to allow the use of a spray bottle as necessary following the extractor run to achieve the required IMC range. This will provide a reliable, validated, and burden-reducing approach to “fine-tune” IMC values that fall just below the target range, such as those seen in DOE’s extractor investigation. This additional direction provides a means to achieve allowable IMC without the need to re-wet and re-spin the test load if the IMC achieved by the extractor is below the target range of IMC.

DOE is not specifying the temperature of the spray bottle water given the amount of time and air exposure that the test load encounters while being spun in the extractor, sprayed, and loaded into the clothes dryer. According to DOE investigative testing, the moisture content provided by the spray bottle is approximately 0.03 percentage points with each spray, up to a maximum of 5.33 percentage points that may be added in the load under appendix D2 to achieve the specified moisture content of the test load of 57.5 \pm 0.33 percent. Recognizing that without such specification, the temperature of water in the spray bottle could be closer to room temperature (*i.e.*, only slightly higher than AHAM's suggestion of 60 °F), it is implausible that the temperature of the water in the spray bottle would change the temperature of the load enough to impact the dryer performance.

In summary, DOE is aligning appendix D1 with appendix D2 by specifically providing for the use of a spray bottle to add water to test loads that are below the acceptable IMC range minimum of 54.0 percent following the extractor run. DOE is not adding a temperature specification for the spray bottle water.

ii. Final Moisture Content

Section 3.3.1 of appendix D2 specifies that for timer clothes dryers, the test load is dried until the FMC is between 1 and 2.5 percent of the bone-dry weight of the test load. The measured energy consumption is then normalized to determine the energy consumption required to dry the test load to 2-percent FMC, with a field use factor applied to account for the over-drying energy consumption, in section 4.1 of appendix D2. For automatic termination control clothes dryers, section 3.3.2 of appendix D2 specifies that a test is considered valid if the FMC of the test load is 2 percent or less.

DOE did not propose amending the FMC requirement of appendix D2 in the July 2019 NOPR.

The California IOUs stated that the 2-percent FMC under the DOE test conditions is appropriate, though suggested that a higher FMC may be appropriate when accounting for additional test conditions, such as changes in clothes dryer settings or a more realistic clothes dryer load. In the absence of any changes to these settings or test load, the California IOUs recommended maintaining the current 2-percent FMC. (California IOUs, No. 29 at p. 20)

Samsung, AHAM, BSH, and GEA commented that requiring an FMC of 2 percent or less promotes over-drying and unnecessary additional energy use; and further, because clothes that are over-dried will typically re-absorb moisture from ambient air during cool-down phases of the drying cycle and after termination of the drying cycle, a higher FMC, between 5 percent and 8 percent, results. Samsung suggested a 4-percent FMC requirement, corresponding to estimated moisture up-take from bone-dry conditions on the 100 percent cotton IEC test load. AHAM and GEA suggested that DOE adopt an FMC range of 3 to 4 percent, with a target of 4 percent. (AHAM, No. 33 at pp. 5, 12; BSH, No. 30 at pp. 1–2, 4; GEA, No. 37 at p. 2; Samsung, No. 36 at p. 2)

BSH and AHAM also referenced the December 2015 Underwriters Laboratory (“UL”) clothes dryer safety requirement in UL 2158, “North American Dryer Safety Standard” that the requirement of a cool-down period if the temperature at the clothes dryer’s lint filter exceeds 131 °F (55 °C) at the end of the drying cycle as a source of difficulty for ventless condensing clothes dryers in meeting the current 2-percent FMC

requirement in appendix D2.²⁹ BSH commented that due to the drying process of a condensing clothes dryer with a closed-loop process air system, the FMC increases rapidly during the cool-down period.³⁰ AHAM and BSH asserted that due to the UL 2158 requirement, attaining an FMC of 2 percent on condensing clothes dryers is impractical, and without costly design changes and adjustments to the test procedure, ventless condensing clothes dryers cannot consistently meet both the new UL 2158 safety limit and the current FMC requirement. BSH suggested a separate FMC target of 4 percent for ventless clothes to compensate for the UL 2158 safety requirement and otherwise agreed with the current 2-percent FMC requirement for vented clothes dryers. (AHAM, No. 33 at pp. 5, 12; BSH, No. 30 at pp. 1–2, 4)

AHAM and BSH also recommended that DOE specify a time limit in which the test load must be weighed after stopping the test cycle to minimize test variation and moisture reabsorption. BSH recommended that the test load be weighed within 10 seconds of the drying cycle termination, and AHAM recommended that the test load be weighed immediately after and within a maximum of 2 minutes after cycle termination. (AHAM, No. 33 at pp. 5, 12; BSH, No. 30 at pp. 1–2, 4; GEA, No. 37 at p. 2; Samsung, No. 36 at p. 2)

The current 2-percent FMC requirement using the DOE test cloth was adopted as representative of approximately 5-percent FMC for “real-world” clothing, based on data submitted in a joint petition for rulemaking.³¹ DOE determined in the August 2013 Final

²⁹ UL 2158 can be accessed at https://standardscatalog.ul.com/standards/en/standard_2158_4

³⁰ A ventless condensing clothes dryer recirculates the air used to remove moisture from the load during the entire drying cycle. The clothes dryer uses ambient air or cold water in a heat exchanger to condense the moisture from the air in the drum. The dry air exiting the drum is then reheated and recirculated back into the drum.

³¹ The petition was submitted by AHAM, Whirlpool Corporation, General Electric Company, Electrolux, LG Electronics, Inc., BSH, Alliance Laundry Systems, Viking Range, Sub-Zero Wolf, Friedrich A/C, U-

Rule that the specified 2-percent FMC using the DOE test load was representative of consumer expectations for dryness of clothing in field use. 78 FR 49608, 49620–49622, 49610–49611 (Aug. 14, 2013).

DOE reviewed the UL 2158 safety requirements and noted that Clause 12 of UL 2158 requires a cool-down period if the drying cycle air temperature exceeds 131 °F at the end of the drying cycle, as measured at the first lint filter. This cool-down period is required to reduce the temperature of the clothes load to a suitable level before the user is alerted that the drying cycle has ended. As described in Clause 12.1 of UL 2158, this safety standard is in place to reduce the risk of spontaneous ignition of the clothes load. DOE acknowledges that the air temperature limit specified by UL 2158 (*i.e.*, requiring a cool-down period to ensure the temperature at the first lint filter at the end of the drying cycle does not exceed 131 °F) may result in moisture regain by the load. DOE notes that the safety requirement regarding cool-down periods was introduced in the fourth edition of UL 2158 and has been effective since December 2015. In its internal testing since that time, DOE has not identified any systemic problems with any clothes dryer types, including ventless condensing clothes dryers, being able to achieve the required FMC of 2 percent or less, such that amendments to the test procedure would be warranted.

Furthermore, commenters did not provide any test results or data to demonstrate that the maximum 2-percent FMC limit is impracticable or unachievable given the UL 2158 safety requirements. DOE also notes that multiple ventless condensing clothes

Line, Samsung, Sharp Electronics, Miele, Heat Controller, AGA Marvel, Brown Stove, Haier, Fagor America, Airwell Group, Arcelik, Fisher & Paykel, Scotsman Ice, Indesit, Kuppersbusch, Kelon, and DeLonghi, American Council for an Energy Efficient Economy, Appliance Standards Awareness Project, Natural Resources Defense Council, Alliance to Save Energy, Alliance for Water Efficiency, Northwest Power and Conservation Council, and Northeast Energy Efficiency Partnerships, Consumer Federation of America and the National Consumer Law Center. See Docket No. EERE–2011–BT–TP–0054, No. 3.

dryers from various manufacturers have been certified to DOE under the appendix D2 test procedure since the introduction of the safety standard in 2015.

Based on the preceding discussion, DOE is not amending the FMC requirement for either appendix D1 or appendix D2 in this final rule.

Regarding a time limit in which the test load must be weighed after stopping the test cycle, section 3.3 of previous appendix D1 and sections 3.3.1 and 3.3.2 of previous appendix D2 required that the test load be weighed “after stopping the test cycle” (for timer clothes dryers) or “after the completion of the test cycle” (for automatic termination control clothes dryers). To better quantify the potential reabsorption effects associated with the interval between completing the clothes dryer test cycle and weighing the test cloth, DOE tested seven clothes dryers according to appendix D2, with five different time periods for weighing the test cloth after termination of the drying cycle. During the waiting period, the test cloth remained in the clothes dryer drum with the door closed. These time periods ranged from weighing the test cloth as immediately as practicable after termination of the drying cycle to 30 minutes after termination of the drying cycle. DOE acknowledges that test load FMC may change after completion of the clothes dryer cycle, generally regaining moisture; however, testing found that the moisture content for certain units decreased as the waiting period increased, relative to the immediate weighing.

Figure III.4 shows the change in FMC measured at varying waiting periods relative to the FMC recorded immediately upon removal of the test load after the drying cycle termination.

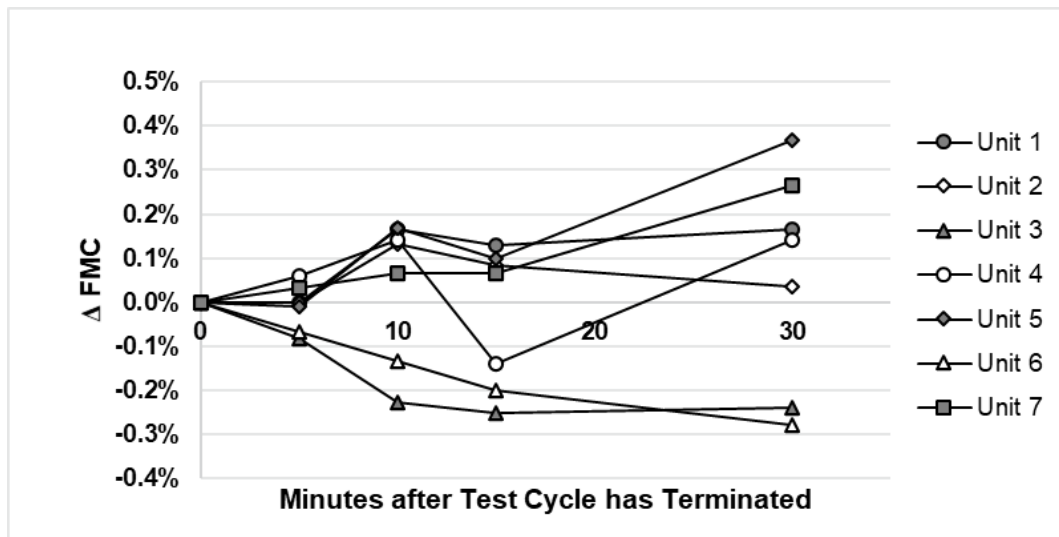


Figure III.4 Change from Immediately Measured FMC versus Waiting Period after Test Cycle Termination

As shown in Figure III.4, moisture regain and loss relative to the immediately measured FMC were observed at the various time periods, with more significant changes in FMC as the time periods increased. At the 5-minute waiting period, however, variation in FMC was consistently within 0.1 percentage points of the FMC recorded immediately after the drying cycle terminated for all units tested. According to these results, and in order to ensure repeatability, reproducibility, and representativeness of the FMC measurement, a time limit of 5 minutes, within which the test load must be weighed, appears appropriate to minimize variability in FMC from the value immediately upon completion of the cycle.

As best practice would result in weighing the test load without any unnecessary delay, and DOE has no indication that testing is currently conducted inconsistent with best practices, DOE does not expect any increase in test burden associated with adoption of a reasonable time limit on weighing the test cloth after termination of a drying cycle to ensure repeatable, reproducible, and representative results. Therefore, to limit any potential variability in the test procedure associated with moisture reabsorption following

the test cycle, DOE is amending section 3.3 of appendix D1 and sections 3.3.1 and 3.3.2 of appendix D2 to specify that FMC must be recorded within 5 minutes following the termination of the drying test cycle.

iii. Final Moisture Content Requirements for Automatic Termination Control

Dryers

Section 3.3.2 of appendix D2 specifies that for automatic termination control dryers, the clothes dryer is operated until the completion of the programmed cycle, including the cool down period. The test procedure provides that, if the FMC is greater than 2 percent, the test is invalid and a new run must be conducted using the highest dryness level setting. In guidance issued on January 10, 2017 (“2017 Guidance”),³² DOE provided its interpretation that the 2-percent FMC threshold for a valid test also applies to a test run conducted using the highest dryness level setting, if required. As explained in the 2017 Guidance, DOE’s interpretation that the 2-percent final moisture content threshold for a valid test should apply to all test cycles conducted according to section 3.3.2 of Appendix D2, including test runs using the highest 2 dryness level setting, is consistent with the EPCA requirements that test procedures must be “reasonably designed to produce test results” that measure energy use “during a representative average use cycle.” 42 U.S.C. 6293(b)(3). Based on the information presented during the prior rulemaking, during the representative average use of a clothes dryer, clothes are dried to an FMC that is equivalent to 2-percent FMC in the DOE test load.

DOE noted in the July 2019 NOPR that, as part of the August 2013 Final Rule, interested parties submitted a joint comment presenting test results that demonstrate that

³² Clothes Dryer Final Guidance issued January 10, 2017. Available at www1.eere.energy.gov/guidance/detail_search.aspx?IDQuestion=665&pid=2&spid=1.

an FMC of 2 percent using the DOE test cloth is representative of the consumer-accepted dryness level after completion of a drying cycle. 84 FR 35484, 35497 (July 23, 2019); see also 78 FR 49608, 49614 (Aug. 14, 2013). DOE agreed with this conclusion and adopted provisions that specify that a test conducted on the “normal” or “medium” dryness setting is considered valid only if the FMC is 2 percent or lower. 78 FR 49608, 49621, 49624 (Aug. 14, 2013).

The California IOUs and the Joint Commenters supported DOE’s clarification that the second test following a failed first test in which the clothes dryer did not achieve an FMC less than or equal to 2 percent should be held to the same FMC requirements as the first test. The California IOUs stated that the second test should not provide a “loophole,” whereby a unit could fail the first test and then use the results of the second test regardless of the FMC. The California IOUs suggested that without this consistency in test procedure and results, clothes dryers that are certified to the second test would not be comparable to those that passed the first test. (California IOUs, No. 29 at p. 20; Joint Commenters, No. 34 at p. 3)

AHAM and Whirlpool expressed concern that it is unclear how verification and enforcement testing would address the requirement that a second test run must meet the required FMC. They suggested that the existing test procedure variation could be enough to cause false findings of non-compliance and may result in a large number of test procedure waiver requests. Whirlpool stated that this requirement would lead manufacturers to conservatively over-dry loads to well below 2-percent FMC, which wastes energy, instead of using the 2-percent FMC as a design target rather than an enforceable performance measure. Whirlpool also suggested that the CEF in the test run with highest dryness level be used regardless of FMC, as Whirlpool asserted that market

forces would ensure manufacturers do not intentionally design clothes dryers with unreasonably high FMC. AHAM suggested raising the FMC for all test runs to accommodate concerns regarding non-compliance and test procedure variation. (AHAM, Public Meeting Transcript, No. 23 at pp. 38–39; AHAM, No. 33 at pp. 5–6; Whirlpool, No. 32 at p. 2)

GEA suggested that there should be no FMC requirement for a second run test under the appendix D2 procedure. GEA noted that the second test run is already performed at the maximum dryness setting, and the clothes dryer is, therefore, subject to a higher performance condition and corresponding increased energy usage. GEA suggested that using the highest dryness setting for the second run ensures appropriate energy usage by a compliant clothes dryer regardless of the FMC, as the clothes dryer is unable to use any more energy for the selected cycle (given that the highest dryness setting was selected). GEA further commented that any remaining moisture in clothing after a cycle is complete on the highest dryness setting is a performance concern, and not an energy efficiency concern, and is therefore outside the scope of the appliance standards program as established under EPCA. (GEA, No. 37 at pp. 2–3)

As discussed, the 2-percent FMC requirement was developed through collaboration with, and consideration of data submitted by, interested parties as part of the August 2013 Final Rule. 78 FR 49608, 49614 (Aug. 14, 2013) Interested parties have not presented any data or information since then that would suggest changes in consumer expectations of dryness levels. Therefore, DOE continues to agree with the conclusion from the August 2013 Final Rule that an FMC of 2 percent using the DOE test cloth is representative of the consumer-accepted dryness level after completion of a drying cycle. Thus, a test that does not produce an FMC of 2 percent or less would not

be reflective of representative energy use, in that FMC values at or below this threshold represent consumer-accepted dryness.

DOE notes that clothes dryer models are certified to DOE and available on the market representing the entire range of venting configurations (vented and ventless), capacity categories (standard and compact), product configurations (stand-alone clothes dryer and combination washer/dryer), energy sources (120V electric, 240V electric, and gas), and drying technologies (electric resistance, water-cooled condensing, air-cooled condensing, and electric heat pump) from multiple manufacturers within each product attribute. The range of available product offerings indicates the ability to achieve a 2-percent FMC across the entire spectrum of clothes dryer design characteristics currently available on the market. Furthermore, DOE has not received any waiver requests, either before or after publishing the 2017 Guidance, regarding an inability to achieve an FMC value of 2 percent or less.

DOE further notes that 2-percent FMC is not a design “target,” but rather a maximum threshold. Any FMC value of 2 percent or less (*i.e.*, 0–2 percent) would represent a valid test. DOE has observed in its testing FMC values spanning the full range of 0–2 percent. Table III.4 shows the range in FMC values from DOE’s testing of 30 different consumer clothes dryers under appendix D2 at a normal dryness setting. These units spanned multiple manufacturers, product classes, capacities, and drying technologies.

Table III.4 FMC Ranges from DOE Testing

FMC Range	Number of Units
0-0.5%	3
0.5-1.0%	8
1.0-1.5%	10
1.5-2.0%	9

In summary, drying to an FMC of 2 percent or less using the DOE test cloth is representative of the consumer-accepted dryness level of a clothing load after completion of a drying cycle. The prevalence of certified consumer clothes dryer models spanning the entire spectrum of design characteristics indicates no inherent inability to achieve an FMC of 2 percent or less for any clothes dryer type currently available on the market. For these reasons, as supported by the preceding discussion, DOE is amending appendix D2 as proposed to specify that the 2-percent FMC requirement applies to all appendix D2 test runs (*i.e.*, including the second test run conducted using the highest dryness level setting, if required). If the basic model under test fails to achieve an FMC of 2 percent or less when tested at the highest dryness level setting, the measured energy consumption of the clothes dryer would not reflect a representative average use cycle, since it would not have dried the clothing to a consumer-accepted dryness level. Such test results may not be used for certification of compliance with energy conservation standards.

Finally, in the July 2019 NOPR, DOE also proposed to amend the nomenclature of section 4.1 through section 4.4 of appendix D2 to clarify that the measured energy consumption values represented by E_{ce} , E_{ge} , E_{gg} , and E_{cg} , respectively, reflect the energy required to achieve an FMC of 2 percent or less. 84 FR 35484, 35496–35497 (July 23, 2019).

Given that there were no comments or concerns with the nomenclature proposed in the July 2019 NOPR, in this final rule DOE is amending the nomenclature of section 4.1 through section 4.4 of appendix D2 as proposed in the July 2019 NOPR.

f. Annual Drying Cycles and Hours Per Year

Section 4.5 of appendix D1 and appendix D2 assigns the representative average use for clothes dryers at 283 drying cycles per year. This estimate was developed based on data provided by the 2005 Energy Information Administration’s “Residential Energy Consumption Survey” (“RECS”). 76 FR 972, 1010 (Jan. 6, 2011). In the 2019 TP NOPR, DOE did not propose an updated value for the annual drying cycles and hours per year, declining to make changes based on a limited field study conducted by NEEA. 84 FR 35484, 35492 (July 23, 2019). DOE noted that its current estimate was developed based on data from the most recent version of RECS at the time the cycles-per-year value was established. 84 FR 35484, 35491 (July 23, 2019). DOE stated that it was continuing to seek data regarding the cycles per year. 84 FR 35484, 35492, 35504 (July 23, 2019).

AHAM commented that the 2015 version of RECS indicates that 238 clothes dryer cycles per year would be more appropriate, as it is based on more recent and nationally representative data. AHAM commented that a reduction in number of annual clothes dryer cycles would be consistent with the trend for the average number of annual clothes washer cycles, which based on RECS 2015 data, AHAM asserted is 241. AHAM suggested that DOE update the number of annual clothes dryer cycles based on more recent national data. (AHAM, No. 33 at pp. 4–5)

To develop the estimate of 283 clothes dryer cycles per year previously specified in the test procedure, DOE utilized the 2005 RECS data to estimate the average number of clothes dryer cycles per year based on clothes washer cycle data and a clothes dryer usage factor (the percentage of washer loads dried in a clothes dryer).³³ The 2015 RECS

³³ The 2005 RECS provided data regarding how often a clothes dryer was used following a clothes washer cycle, with answers of “every time you wash clothes”, “use it for some, but not all loads of wash”, “use it infrequently”. Using that information and clothes washer usage data, the estimate of 283 annual clothes dryer cycles was developed.

data, which included cycle data specific to clothes dryers, was first released in April 2017, and then subsequently updated multiple times with the most recent update, Version 4, released in December 2018.³⁴ DOE calculated the average number of clothes dryer cycles per year, using the reported number of laundry loads (clothes dryer cycles) dried per week for each sample home in the 2015 RECS data set with a clothes dryer, which is the same methodology DOE used to develop the estimates of 283 clothes dryer cycles per year based on the 2005 RECS data set. Using this methodology, DOE calculated 236 cycles per year from the 2015 RECS data. Because this estimate is based on more recent consumer usage data than the previous estimate of 283 cycles per year, DOE concludes that the estimate of 236 cycles per year is a more representative estimate of the average number of annual clothes dryer cycles at this time. DOE notes that its estimate of 236 clothes dryer cycles per year is very close to the estimate of 238 cycles per year presented by AHAM.

DOE is updating the estimate of the representative average annual number of clothes dryer cycles per year in section 4.5 of appendix D2. This update maintains the methodology used to establish the average number of clothes dryer cycles per year and updates the resulting average based on an update to the underlying data source (*i.e.*, RECS), as recommended by commenters. The updated estimate will impact the measured energy efficiency of clothes dryers by reducing the portion of annual hours in active mode, thereby increasing the per-cycle standby mode and off mode energy consumption as determined in section 4.5 of appendix D2. Also, DOE notes that the current energy conservation standards were developed based on the 283 cycles per year estimate. As such, the updated clothes dryer annual cycles per year estimate will be

³⁴ The most recent RECS microdata can be accessed at www.eia.gov/consumption/residential/data/2015/index.php?view=microdata

required beginning on the compliance date of amended energy conservation standards for clothes dryers, should standards be amended. Prior to any such amendment to the energy conservation standards, the DOE test procedure will continue to use the estimate of 283 clothes dryer cycles per year in the per-cycle standby mode and off mode energy consumption calculation.

2. Inactive and Off Mode Power Measurements

Section 3.6 of appendix D1 and appendix D2³⁵ provides the instructions for measuring standby (“inactive”) mode^{36,37} and off mode³⁸ power on the clothes dryer. The per-cycle combined total energy consumption of a clothes dryer includes the combined representative measures of inactive mode and off mode power in sections 4.5 and 4.6, respectively, of appendix D1 and appendix D2. The test procedure distinguishes between inactive mode and off mode. However, when only one of the low-power modes is present, regardless of whether the low-power mode is considered inactive mode or off mode, the same measurement and calculation is performed.³⁹

³⁵ In this final rule, section 3.6 of appendix D2 is being renumbered as section 3.5, as a result of removing obsolete provisions from the test procedures. See section III.E.5 of this final rule for additional details.

³⁶ Section 1.17 of appendix D1 and section 1.18 of appendix D2 define “standby mode” as any mode in which the product is connected to a mains power source and offers one or more of the following user-oriented or protective functions that may persist for an indefinite period of time: (1) a function that facilitates the activation of other modes (including activation or deactivation of active mode) by remote switch (including remote control), internal sensor, or timer; or (2) continuous functions, including information or status displays (including clocks) or sensor-based functions. The definition also specifies that a timer is a continuous clock function (which may or may not be associated with a display) that provides regular, scheduled tasks (*e.g.*, switching) and that operates on a continuous basis.

³⁷ Section 1.12 of appendix D1 and section 1.13 of appendix D2 define “inactive mode” as a standby mode that facilitates the activation of active mode by remote switch (including remote control), internal sensor, or timer, or that provides continuous status display.

³⁸ Section 1.15 of appendix D1 and section 1.16 of appendix D2 define “off mode” as a mode in which the clothes dryer is connected to a mains power source and is not providing any active mode or standby function, and where the mode may persist for an indefinite period of time. The definition further states that an indicator that only shows the user that the product is in the off position is included within the classification of an off mode.

³⁹ Distinguishing inactive mode from off mode is not an issue when both are present. When both modes are present, inactive mode and off mode can be distinguished from each other based on the measured energy use; *i.e.*, inactive mode will result in a higher measured energy use than off mode.

The prior test procedure for measuring inactive and/or off mode power is as follows. Section 3.6.1 of appendix D1 and appendix D2 instructs inactive mode to be measured, if the clothes dryer has an inactive mode, with the resulting measurement represented by the symbol P_{IA} . Similarly, section 3.6.2 of both appendices instructs off mode power to be measured, if the clothes dryer has an off mode, with the resulting distinct power measurement represented by symbol P_{OFF} . In section 4.5 of both appendices, if a clothes dryer has either inactive mode or off mode (but not both), the measured power is multiplied by 8,620, representing the combined annual hours that the clothes dryer is not in active mode (*i.e.*, idle). Alternately, if a clothes dryer has both inactive mode and off mode (*e.g.*, an electronic control panel that also provides a hard off switch that can completely disconnect all power to the product), the power of each mode is measured and multiplied by one-half of 8,620 (*i.e.*, 4,310), and the results are summed.⁴⁰ As these sections were structured, a determination first had to be made whether the low-power mode(s) that exists on the clothes dryer meets the definition of inactive mode or off mode—even though the same calculation applies, yielding the same end result, regardless of the distinction.

As discussed in the July 2019 NOPR, the “off” state on some appliances is achieved through a software/firmware action (*i.e.*, through a “soft switch”) rather than a hard on/off switch (*i.e.*, a switch that physically breaks the connection to the mains power supply), and it may not always be clear whether the product is providing any active mode or standby function while in the “off” state. 84 FR 35484, 35495. To address questions regarding the potential difficulty in determining whether the low-power mode is considered inactive mode or off mode without needing to remove a product’s console to

⁴⁰ This calculation represents an estimate that such a clothes dryer would spend half of its low-power mode hours in inactive mode, and the other half of its low-power mode hours in off mode.

access the electrical schematic and/or determine if the switch is a “hard” switch or “soft” electronic switch, DOE proposed the following changes to appendix D1 and appendix D2 in the July 2019 NOPR:

- Replace the symbols P_{IA} and P_{OFF} , for measuring inactive mode⁴¹ and off mode, respectively, with $P_{default}$ and P_{lowest} , including revisions to the calculation symbols in section 3.6.1 of appendix D1 and 3.5.1 of appendix D2. $P_{default}$ represents the low-power measurement if only one power level is observed. If two power levels are observed, P_{lowest} represents the off mode power measurement and $P_{default}$ represents the inactive mode power measurement.
- For clothes dryers with both an inactive mode and off mode (*i.e.*, clothes dryers with electronic controls that offer an optional switch (or other means) that can be selected by the end user to achieve a lower power state than the default inactive/off mode state),⁴² section 3.6.2 of appendix D1 and 3.5.2 of appendix D2 require that, after performing the measurement in section 3.6.1 of appendix D1 or 3.5.1 of appendix D2, the switch (or other means) be activated to the position resulting in the lowest power consumption and the measurement procedure described in section 3.6.1 and 3.5.1, respectively, be repeated. Measure and record the average power consumption as the lowest standby/off mode power, P_{lowest} , in watts.

⁴¹ Inactive mode is the only type of standby mode required to be measured in appendix D1 and appendix D2.

- Revise section 3.6 of appendix D1 and newly renumbered section 3.5 of appendix D2 to state that for a clothes dryer that takes time to automatically enter a stable inactive/off mode state from a higher power state, as discussed in Section 5, Paragraph 5.1, note 1 of IEC Standard 62301, allow sufficient time for the clothes dryer to automatically reach the default inactive/off mode state before proceeding with the test measurement. Replace the term “lower power state” with “default standby/off mode state,” recognizing that the lower power state that the clothes dryer reaches by default may be either a standby (inactive) mode or an off mode.
- Perform standby mode and off mode testing after completion of an active mode drying cycle; after removing the test load; without changing the control panel settings used for the active mode drying cycle; with the door closed; and without disconnecting the electrical energy supply to the clothes dryer. DOE noted that the order of sections within the clothes dryer test procedures suggests that the standby mode and off mode measurement (section 3.6 of appendix D1 and section 3.5 of appendix D2) is performed after the active mode test cycle (sections 3.3 through 3.5 of appendix D1 and sections 3.3 and 3.4 of appendix D2); therefore, the proposed approach likely reflects current practice within the industry. 84 FR 35484, 35495–35496 (July 23, 2019).

AHAM supported the proposal to amend the clothes dryer test procedures to use nomenclature, symbols, and structure, procedural instructions, and assigned annual hours based on observable and measurable characteristics of the clothes dryer, rather than based

on knowledge of the control panel switch type or internal functionality of the clothes dryers. AHAM supported DOE's proposed modification to the sequence of testing for standby or off mode power measurement to perform the standby mode and off mode testing after the active mode testing, which reflects current practice by test laboratories. (AHAM, No. 33 at p. 9)

In this final rule, DOE is amending the test procedure in accordance with the proposals outlined above, adding new symbols to represent the “default” and “lowest” standby power measurements, along with instructions for their applications based on observable characteristics of the clothes dryer. DOE is also amending appendix D1 and appendix D2 to specify that inactive and off mode tests must be performed after completion of an active mode drying cycle, and the unit must be allowed sufficient time to automatically reach its default inactive/off mode power state before performing measurements. Under the revised section 3.6 of appendix D1 and newly renumbered section 3.5 of appendix D2, DOE is requiring that the same sequence of measurements be performed as in the previous section 3.6 in both appendix D1 and appendix D2, to yield the same power measurement(s) for clothes dryers with inactive mode, off mode, or both. Further, DOE is specifying that the same annual hours that were previously specified shall be applied to the average power measurement(s) in section 4.5 of both appendix D1 and appendix D2. DOE has determined that these amendments to appendix D1 and appendix D2 will not impact the measured efficiency of clothes dryers, because the amendments are amendments to nomenclature and provide additional direction.

3. General Test Procedure Provisions at 10 CFR 430.23(d)

The general test procedure provisions for clothes dryers in 10 CFR 430.23(d) include methods for calculating the estimated annual operating cost, CEF, and other useful measures of energy consumption using appendix D1. In the July 2019 NOPR, DOE proposed to amend the test procedure to provide explicitly for calculating each of these metrics using appendix D2 as well as to include methods of calculating the estimated annual energy use.

AHAM and the Joint Commenters supported DOE's proposal to extend calculations of energy consumption to appendix D2 and to add a new calculation of annual energy use, stating that this would ensure consistency in the test procedure. (AHAM, No. 33 at p. 9; Joint Commenters, No. 34 at p. 3)

DOE is adopting the test procedure amendments as proposed in the July 2019 NOPR to provide explicitly for the calculation of useful measures of energy consumption, including estimated annual energy use, using appendix D2.

4. Rounding Requirements for Reported Values

In the July 2019 NOPR, DOE proposed adding a new section at 10 CFR 429.21(c) to specify the rounding requirements of all numeric reported values for clothes dryers, including CEF, capacity, voltage, and hourly Btu rating. Similarly, DOE proposed adding the same rounding requirement for the capacity measurement in section 3.1 of both appendix D1 and appendix D2, which would add specificity to the measurement of drum capacity as it relates to determining whether a compact-size load (for a drum capacity less than 4.4 cubic feet) or standard-size load must be used for testing. The proposed rounding requirements for CEF, capacity, voltage, and Btu rating would

maintain consistency with the level of precision currently provided in DOE's Compliance Certification Management System ("CCMS").

DOE also proposed to specify further the rounding instructions provided at 10 CFR 430.23(d)(1) (renumbered to paragraph (d)(2) as amended in this document) pertaining to estimated annual operating cost. Previously, the rounding instructions for an electric clothes dryer were provided in paragraph (d)(1)(i)(C). DOE proposed moving the rounding instructions to paragraph (d)(1)(i) to clarify that the rounding provision applies to the product of all three factors multiplied in paragraphs (d)(1)(i)(A), (B), and (C). Similarly, for gas clothes dryers, DOE proposed to move the rounding instructions from its previous location embedded within paragraph (d)(1)(ii)(B) to the higher-level paragraph at paragraph (d)(1)(ii).

AHAM and GEA supported DOE's proposal to specify the rounding requirements of all numeric reported values for clothes dryers. Additionally, AHAM and GEA requested that DOE clarify the rounding requirements for scale weight measurements. AHAM recommended the rounding of scale weight values to the nearest whole number digit, asserting the absence of such a specification in conjunction with the required minimum scale resolution may result in an unacceptable range of variation.⁴³ These commenters stated that rounding to the nearest whole number for FMC is acceptable based on the current state of the clothes dryer test procedure, the measurement error, and laboratory capabilities. (AHAM, No. 33 at pp. 9-10, 12; GEA, No. 37 at p. 2)

⁴³ Section 2.4.1 of appendices D1 and D2 specify that the weighing scale for test cloth shall have a range of 0 to a maximum of 60 pounds with a resolution of at least 0.2 ounces, and a maximum error no greater than 0.3 percent of any measured value within the range of 3 to 15 pounds. AHAM suggested that applying this allowable error to the weight of the bone-dry test cloth and test cloth after the test cycle, with a measured FMC of 2 percent, could in fact be as high as 2.4 percent or as low as 1.6 percent. AHAM suggested that rounding FMC would eliminate the need to resolve issues with scale resolution that result in potentially misreporting FMC.

GEA asserted that rounding to the nearest whole number for moisture content resolves the instrumentation resolution issue and is in keeping with ASTM's best practice guidance. (GEA, No. 37 at p. 2) AHAM reported that its members have noted that there is inherent measurement variation (compounded tolerance) that can cause a theoretical FMC of 2 percent to be reported as high as 3 percent.⁴⁴ AHAM recommended a resolution for scales of at least 0.005 pounds with a maximum error of no greater than 0.1 percent of any measured value. AHAM also recommended specifying the same scale be used for bone-dry weight, IMC, and FMC measurements. AHAM suggested that this change would not add cost to the test as it expects laboratories already have instrumentation capable of this resolution. (AHAM, No. 33 at pp. 9–10, 12) As discussed in section III.C.4 of this document, GEA supported all requests for tighter tolerances in the AHAM comments. GEA agreed that the current test procedure allows for tolerance stacking issues that introduce variability in the DOE verification process and reported that the suggested tolerances would not increase test burden or cost. (GEA, No. 37 at p. 2)

DOE proposed rounding requirements in the July 2019 NOPR, which implicate the weighing scale resolution,⁴⁵ as noted by the comments received, in ensuring repeatable and reproducible test results. DOE acknowledges that, in the absence of revised scale resolution requirements, hypothetically a variation as described by AHAM could occur. However, under current testing practice this is not occurring. Based on interactions with testing laboratories, DOE is aware that, in general, test laboratories are

⁴⁴ AHAM applied the maximum allowable measurement error of ± 0.3 percent to the bone-dry test cloth weight and final test cloth weight measurements. AHAM stated that a final FMC value of 2 percent could yield a measurement between 1.4 percent and 2.6 percent, given the allowable measurement error of ± 0.3 percent.

⁴⁵ Rounding requirements relate to the number of significant digits of the measured value, which are dictated by the resolution of the weighing scale.

currently measuring test load weight using instrumentation with a scale resolution of 0.001 pounds and a maximum error of no greater than 0.1 (the value suggested by AHAM) percent of any measured value. This level of precision addresses the issue of compounded tolerance by effectively bounding a 2-percent FMC measurement between a range of 1.8 – 2.2 percent rather than 1.4 – 2.6 percent. Accordingly, instead of addressing AHAM and GEA’s concern through further rounding amendments, DOE is addressing the issue by codifying the current practice to ensure that the issue as described by commenters does not occur in the future. Also, rounding to the nearest whole number for FMC as suggested by these commenters would reduce the stringency of the requirement, given that an FMC of 2.4 percent could be rounded down to 2 percent, effectively raising the FMC requirement to be less than 2.5 percent as opposed to the prior requirement of 2 percent. For these reasons, DOE is not amending FMC rounding requirements at this time. Instead, DOE is amending the scale tolerance and maximum error requirements to align with the current capabilities of test laboratories, thereby codifying this level of precision and addressing the issues of compounding tolerance raised by commenters. Specifically, DOE is amending the scale resolution requirements to be 0.001 pounds with a maximum error of no greater than 0.1 percent of any measured value in section 2.4.1 of both appendix D1 and appendix D2.

DOE received no comments pertaining to the other specific rounding requirements proposed in the July 2019 NOPR. DOE is adopting all proposed rounding requirement changes from the July 2019 NOPR in the newly added 10 CFR 429.21(c).

5. Optional Usage of Appendix D1 or Appendix D2

As discussed, manufacturers must use either appendix D1 or appendix D2 to demonstrate compliance with the applicable energy conservation standards, and must use

a single appendix for all representations, including certifications of compliance.⁴⁶ The current efficiency standards are based on appendix D1. Appendix D1 tests timed drying cycles, and accounts for clothes dryers with automatic termination controls by applying a higher field use factor to units that have this feature. Appendix D2 tests “normal” automatic termination cycles.

NEEA, the California IOUs, NRDC, CEE, Energy Solutions, and Samsung recommended that DOE require testing under appendix D2 only, and delete appendix D1. NEEA commented that ENERGY STAR has now labeled 286 clothes dryer models from 18 different manufacturers with appendix D2 test procedure data, with an Environmental Protection Agency (“EPA”) estimated ENERGY STAR model market penetration of 35 percent. NEEA further commented that DOE reports that 269 unique models (43.5 percent) in its CCMS database were tested according to appendix D2 and 350 unique models (56.5 percent) were tested under appendix D1. The California IOUs, NEEA, and Samsung asserted that manufacturers have had sufficient time to adapt to appendix D2. These commenters suggested that the intention of having both appendix D1 and appendix D2 available for manufacturers was to ease the transition to the more representative automatic cycle termination test of appendix D2, and now that the appendix D2 test procedure has been adopted by ENERGY STAR and is commonly used, there no longer appears a need to test a model to appendix D1. (NRDC, No. 35 at pp. 1–2; CEE, No. 27 at pp. 1–3; California IOUs, No. 29 at pp. 16–19; Energy Solutions, Public Meeting Transcript, No. 23 at p. 56; Samsung, No. 36 at p. 2; NEEA, No. 38 at pp. 3–9, 18)

The California IOUs, CEE, NRDC, and NEEA further asserted that appendix D1 artificially inflates the efficiency performance of units with poorly functioning automatic

⁴⁶ ENERGY STAR certification requires testing using appendix D2. The ENERGY STAR clothes dryer specification can be found at www.energystar.gov/products/appliances/clothes_dryers/partners

cycle termination features, since it applies a uniform field use factor to all units with such a feature, impacting efficiency rank order. However, the California IOUs also suggested that as clothes dryers deploy improved automatic termination controls and clothes dryer operations, results from appendix D1 may not always be higher than those from appendix D2, an assertion that the California IOUs stated is supported by the 2019 PG&E testing. One unit from the PG&E test sample of four models had a higher CEF value using appendix D2 as compared to appendix D1. NEEA also cited the PG&E data, and both NEEA and the California IOUs commented that recent DOE-funded clothes dryer testing at Oak Ridge National Laboratory (“ORNL”) and PNNL similarly confirmed that the same clothes dryer models tend to achieve a higher efficiency value when tested to the appendix D1 test procedure than when tested to the appendix D2 test procedure, though the observed differences were not consistent across all models. Based on those reports,⁴⁷ NEEA stated that: (1) CEF values dropped roughly 18 percent when tested according to appendix D2, and the efficiency rank order among the tested models changed as well; (2) on average, the appendix D1 loads had five times the FMC than the appendix D2 loads at termination, but all FMCs were within acceptable limits for both test procedures, which implies that the energy use measured under appendix D1 will be less than the energy use measured under appendix D2 for the same clothes dryer, as clothes dryers remove more moisture under appendix D2; and (3) drying times increased by roughly 80 percent when tested according to appendix D2. (NRDC, No. 35 at pp. 1–2; CEE, No. 27 at pp. 1–3; California IOUs, No. 29 at pp. 16–19; NEEA, No. 38 at pp. 3–9, 18)

NEEA, the California IOUs, CEE, and NRDC stated that testing all models to the same procedure would facilitate comparison of performance between them, increasing

⁴⁷ Residential Clothes Dryer Performance Under Timed and Automatic Cycle Termination Test Procedures, Kyle Gluesencamp, ORNL, October 2014; Clothes Dryer Automatic Termination Sensor Evaluation: Volume 1: Characterization of Energy Use in Residential Clothes Dryers, W. TeGrotenhus, PhD, PNNL, September 2014

the utility of the CCMS database and ENERGY STAR certification. NRDC and NEEA also suggested that using a single, uniform test procedure would allow for efficiency labeling of clothes dryers under the Federal Trade Commission (“FTC”) EnergyGuide labelling program. (NRDC, No. 35 at pp. 1–2; CEE, No. 27 at pp. 1–3; California IOUs, No. 29 at pp. 16–19; NEEA, No. 38 at pp. 3–9, 18)

NRDC and the California IOUs suggested that because the current standards are based on appendix D1, it might be more appropriate to implement the retirement of appendix D1 during the next standards rulemaking, and they urged DOE to do so if it is not possible in this final rule. (NRDC, No. 35 at pp. 1–2; California IOUs, No. 29 at pp. 16–19)

AHAM opposed the removal of appendix D1 and mandatory use of appendix D2. AHAM did not support the existence of different test procedures to demonstrate compliance with the standard, but recognized that manufacturers must currently use a different test procedure to demonstrate ENERGY STAR eligibility for clothes dryers than compliance with energy conservation standards. AHAM stated that because manufacturers have already invested in developing products under this circumstance, it would not be equitable to change the status quo at this time. Accordingly, AHAM urged DOE to maintain both appendices, with appendix D2 being optional as an alternative to appendix D1. (AHAM, No. 33 at p. 11)

A majority of the clothes dryers on the market continue to test under appendix D1. DOE notes that 746 clothes dryer models (62.6 percent) listed in the CCMS database are certified to appendix D1, as compared to 445 models (37.4 percent) to appendix D2. DOE recognizes that under appendix D2, measured CEF values may be lower than CEF

values measured under appendix D1. As discussed, appendix D2 includes methods for more accurately measuring the effects of automatic cycle termination and represents a significantly different testing methodology that may impact the energy consumption of some clothes dryers more than others. The current energy conservation standards are based on the test procedure in appendix D1, and to the extent that measured CEF under appendix D2 is lower than the measured CEF under appendix D1, this difference does not result in products being able to demonstrate compliance with a lower efficiency. For these reasons, DOE is maintaining the appendix D1 and appendix D2 test procedures and is continuing to allow certification in accordance with either test procedure.

6. Cycle Time Reporting

Manufacturers are not currently required to report cycle time as part of the certification process. In response to the July 2019 NOPR, DOE received comments regarding the reporting of cycle times to inform consumer purchasing decisions.

AHAM stated that the purpose of the energy conservation standards program is to regulate the efficiency of the product, not to inform consumers about all of the different factors that could affect their purchase. AHAM asserted that, while DOE should consider the impact of energy conservation standards on performance factors such as drying time, it is not appropriate for DOE to collect data on and create requirements for performance factors. AHAM questioned whether collecting data on drying time was permissible under EPCA. (AHAM, Public Meeting Transcript, No. 23 at pp. 83–84)

NEEA suggested that DOE should require manufacturers to report drying time when testing using appendix D2, because certain efficient clothes dryers might achieve higher efficiency by taking a very long time to dry clothes. (NEEA, Public Meeting

Transcript, No. 23 at pp. 79–80) NEEA and PG&E encouraged DOE to require reporting of cycle times, suggesting that cycle time is a performance feature that consumers value. (NEEA, No. 38 at pp. 3, 12–16, 18; PG&E, Public Meeting Transcript, No. 23 at pp. 80–81)

As stated, EPCA requires that the test procedures prescribed or amended by DOE be reasonably designed to produce test results which measure energy efficiency, energy use, or estimated annual operating cost of a covered product during a representative average use cycle or period of use, and not be unduly burdensome to conduct. (42 U.S.C. 6293(b)(3)) DOE may require each manufacturer of a covered product to submit information or reports with respect to energy efficiency or energy use of such covered products to ensure compliance with the requirements of EPCA. (42 U.S.C. 6296(d)) DOE recognizes that cycle time is a relevant consideration under the current product class structure.

On December 16, 2020, DOE published a final rule (“December 2020 Final Rule”) establishing a separate product class for consumer clothes dryers that offer cycle times for a normal cycle of less than 30 minutes. 85 FR 81359.⁴⁸ On January 19, 2021, the States of California, Connecticut, Illinois, Maine, Michigan, Minnesota, New Jersey, New Mexico, New York, Nevada, Oregon, Vermont, and Washington, the Commonwealth of Massachusetts, the District of Columbia, and the City of New York filed a petition for review of the December 2020 Final Rule in the Second Circuit. Shortly thereafter, two other groups of petitioners filed petitions for review of the December 2020 Final Rule. The Alliance for Water Efficiency, the U.S. Public Interest Research Group, and Environment America filed a petition for review of that

⁴⁸ The December 2020 Final Rule also established short-cycle product classes for residential clothes washers.

final rule in the Seventh Circuit on January 17, 2021, and the Sierra Club filed a petition for review of that final rule in the Ninth Circuit on February 12, 2021. After transfer of the Seventh and Ninth Circuit petitions for review, all three cases were consolidated in the Second Circuit. Briefing on the merits is currently stayed through October 1, 2021, while DOE reviews the December 2020 Final Rule. Additionally, on April 2, 2021, AHAM petitioned DOE to reconsider the December 2020 Final Rule that established and amended standards for short-cycle residential clothes washers and dryers.⁴⁹ In its petition AHAM requested that DOE withdraw the December 2020 Final Rule. (*Id.* at p. 19)

DOE is re-evaluating the analysis in the short-cycle product class determination pursuant to Executive Order 13990, *Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis*. In light of the on-going review, DOE is not adopting reporting requirements for cycle time in this final rule.

E. Formatting Changes and Typographical Errors

To improve the readability of the text in certain sections of appendix D1 and appendix D2, DOE is making minor typographical corrections and formatting modifications as discussed in the following paragraphs. These minor modifications do not change the substance of the test methods and do not impact the measured energy use.

1. “Conventional” and “Vented” Nomenclature

Previously, appendix D1 and appendix D2 defined the term “conventional clothes dryer” as a clothes dryer that exhausts the evaporated moisture from the cabinet. Appendix D1, section 1.7; appendix D2, section 1.8. This definition is synonymous with a “vented clothes dryer.” Conversely, “ventless clothes dryer” is defined as a clothes

⁴⁹ EERE-2020-BT-STD-0001-0048, at www.regulations.gov.

dryer that uses a closed-loop system with an internal condenser to remove the evaporated moisture from the heated air. Appendix D1, section 1.19; appendix D2, section 1.21. The moist air is not discharged from the cabinet. *Id.*

The product classes in DOE clothes dryer energy conservation standards use the terms “vented” and “ventless” to refer to the different methods used by the clothes dryer to remove moisture from the cabinet. 10 CFR 430.32(h)(3). To provide consistency between these product classes and the terminology used in the clothes dryer test procedures, DOE is replacing the word “conventional” with “vented” throughout both appendix D1 and appendix D2. This change affects the nomenclature only and does not affect the classification of clothes dryers or conduct of the test procedure for any clothes dryers.

2. Symbol Definitions

Previously, appendix D1 and appendix D2 included inconsistent use of symbol definitions for the measured bone-dry weight and moisture content values. DOE is adding the symbol definition for bone-dry weight (W_{bonedry}) to section 3.4.1 of both appendices, where it is first referenced. DOE is changing the symbol definitions for moisture content of the wet test load (previously W_w) and moisture content of the dry test load (previously W_d) to IMC and FMC, respectively, to better differentiate these percentage values from W_{bonedry} , which is a weight value. See section 4.1 of both appendix D1 and appendix D2. Similarly, DOE is also adding the symbol definitions IMC and FMC to section 3.4.2 and section 3.4.3, respectively, where these values are first referenced in both appendix D1 and appendix D2. DOE is also updating the symbols used throughout section 4 of both appendices in each calculation in which these terms are used. The additions and revisions of these symbol definitions will more readily provide

an understanding of the measured values associated with each of these symbols, as well as improve the readability of subsequent sections of the test procedures where these symbols are referenced.

3. Removal of Duplicate Instructions for Test Load Preparation

Section 2.7.1 and section 2.7.2 of both appendix D1 and appendix D2 provide instructions for preparing a compact-size clothes dryer load and a standard-size clothes dryer load, respectively. Each section previously specified the required load weight and then provided the same instructions for preparing a damp test load before loading. DOE is restructuring section 2.7.1 and section 2.7.2 in each appendix to remove this duplication. For both appendices, the revised section 2.7.1 includes a table specifying the required test loads for standard-size and compact-size clothes dryers, in addition to the requirement that each test load must consist of energy test cloths and no more than five energy stuffer cloths. For both appendices, the revised section 2.7.2 provides the procedure for dampening the test load. These amendments do not change the conduct of the test procedure for either appendix D1 or appendix D2 but improve readability of the test procedures.

4. Typographical Errors

In this final rule, DOE is correcting the following typographical errors in appendix D1 and appendix D2:

Section 1.5 and section 2.6 of appendix D1 and section 1.6, section 2.7.1, and section 2.7.2 of appendix D2 used the term “test clothes,” where “test cloths” should have been used instead. Section 1.16 of appendix D2 misspelled the term “classification” in the definition of “off mode.”

Section 2.4.1 of both appendix D1 and appendix D2 contained section numbering errors. Previously, section 2.4.1 was titled *Weighing scale for test cloth* and included specifications for the scale used to weigh the test loads, and the section that followed was incorrectly numbered as section 2.4.1.2 *Weighing scale for drum capacity measurements*. DOE is correcting this in both appendix D1 and appendix D2 by inserting a new title, section 2.4.1 *Weighing scales*, and renumbering existing section 2.4.1 *Weighing scale for test cloth* as section 2.4.1.1.

The calculation of the total per-cycle electric clothes dryer energy consumption in section 4.1 of appendix D1 referenced an undefined symbol “ E_t ”, which should instead have been “ E_t ”, the total energy consumed during the test cycle as recorded in section 3.4.5 of appendix D1. The word “for” was also missing from the wording of the description of the 1.04 field use factor in section 4.1 of appendix D1.

In addition, section 4.3 of both appendix D1 and appendix D2 referenced the symbol “ E_{ge} ”, which should instead have been “ E_{gg} ”, the calculated gas clothes dryer gas energy consumption per cycle.

5. Removal of Obsolete Provisions

Section 1.14 of appendix D1 and section 1.15 of appendix D2 provided a definition for “moisture sensing control;”⁵⁰ similarly, section 1.18 of appendix D1 and section 1.19 of appendix D2 provided a definition for “temperature sensing control.”⁵¹

⁵⁰ “Moisture sensing control” is defined as a system which utilizes a moisture sensing element within the dryer drum that monitors the amount of moisture in the clothes and automatically terminates the dryer cycle.

⁵¹ “Temperature sensing control” is defined as a system which monitors dryer exhaust air temperature and automatically terminates the dryer cycle.

Both of these definitions were obsolete, having been incorporated into a broader term “automatic termination control”⁵² in section 1.4 of both appendices as part of the January 2011 Final Rule. 76 FR 972, 978 (Jan. 6, 2011). In addition, the terms “moisture sensing control” and “temperature sensing control” were not referenced anywhere else within appendix D1 or appendix D2. DOE is removing these definitions from both appendices and renumbering the subsequent sections of the test procedure accordingly.

Section 3.5 of appendix D2 described the application of a field use factor for clothes dryers with automatic termination controls. In the August 2013 Final Rule, DOE eliminated the field use factor in appendix D2 for automatic termination control clothes dryers, in conjunction with new procedures that directly measure any over-drying energy consumption of automatic termination control clothes dryers. 78 FR 49608, 49611 (Aug. 14, 2013). In the August 2013 Final Rule, DOE erroneously retained the obsolete section 3.5 of appendix D2. DOE therefore is removing section 3.5 of appendix D2 and adjusting the numbering of subsequent sections accordingly.

Section 4.7 of both appendix D1 and appendix D2 provided the equation for calculating EF. DOE’s energy conservation standards for clothes dryers were based on energy factor (“EF”) for clothes dryers manufactured on or after May 14, 1994 and before January 1, 2015. However, as of January 1, 2015, clothes dryer energy conservation standards are based on the CEF metric. Similarly, DOE’s certification reporting requirements for clothes dryers at 10 CFR 429.21(b)(2) required reporting CEF when using appendix D1 or appendix D2; EF was required only when using appendix D,

⁵² “Automatic termination control” is defined as a dryer control system with a sensor which monitors either the dryer load temperature or its moisture content and with a controller which automatically terminates the drying process. A mark, detent, or other visual indicator or detent which indicates a preferred automatic termination control setting must be present if the dryer is to be classified as having an “automatic termination control.” A mark is a visible single control setting on one or more dryer controls.

which is obsolete and is removed in this final rule. Furthermore, ENERGY STAR qualification is based on the CEF metric. DOE is not aware of any current regulatory programs or criteria that use the EF metric. Therefore, DOE is removing the obsolete calculation of EF in section 4.7 of both appendix D1 and appendix D2, renumbering the subsequent sections of the test procedures accordingly, and removing EF as a measure of energy consumption described at 10 CFR 430.23(d)(2).

F. Removing Obsolete Appendix D

In the July 2019 NOPR, DOE proposed to remove appendix D from 10 CFR part 430, since this version of the test procedure is no longer used. DOE also proposed to remove the references to appendix D from 10 CFR 430.23(d), as well as in the clothes dryer certification reporting requirements in 10 CFR 429.21(b)(2).

AHAM stated that it did not oppose DOE's proposal to remove appendix D, because this appendix is no longer mandatory. (AHAM, No. 33 at p. 11) No other comments were received on the removal of appendix D.

Given that appendix D is no longer in use, DOE is removing appendix D and all associated references throughout 10 CFR 429.21 and 10 CFR 430.23(d).

G. Test Procedure Costs and Impact

EPCA requires that test procedures adopted by DOE not be unduly burdensome to conduct. In this document, DOE amends the existing test procedure for residential clothes dryers. DOE has determined that the test procedure as amended by this final rule will not be unduly burdensome for manufacturers to conduct

In this final rule, DOE adopts a number of amendments to both appendix D1 and appendix D2. The current energy conservation standards for clothes dryers were developed based on results obtained using appendix D1. As discussed in the following sections, neither the amendments to appendix D1 or appendix D2 will impact the current costs of the test procedures.

None of the amendments to appendix D1 or appendix D2 will impact the scope of the test procedure (*i.e.*, the amendments will not require manufacturers to test clothes dryers that are not already required to be tested). Additionally, DOE has determined that none of the amendments will require manufacturers to re-test or re-certify any existing models on the market that have been tested and certified using appendix D1 or appendix D2.

Based on the discussion that follows, DOE has determined that these amendments to the clothes dryer test procedure in appendix D1 and appendix D2 will not be unduly burdensome for manufacturers to conduct.

1. Maintaining Hourly Btu Rating for Gas Clothes Dryers

DOE specifies the order of adjustment, from least burdensome to most burdensome, for the three types of adjustments that can be made to maintain the required heat input rate for natural gas and propane clothes dryers. As described, this amendment is generally consistent with industry practice. To the extent that any deviations from this order may occur in practice, the additional direction provided by these amendments will not require any manufacturers to retest or re-certify any basic models currently on the market because the net result of maintaining the hourly Btu rating within ± 5 percent of

the rated value will not change. Therefore, drying performance will not be impacted in comparison to results obtained under the previous test procedures.

2. Final Moisture Content Requirement

DOE explicitly specifies that any second test run using the highest dryness level setting must result in an FMC of 2 percent or less for the test to be considered valid. This amendment impacts only appendix D2, and therefore has no impact on testing under appendix D1. As described, this amendment reflects the current practice of manufacturers and test laboratories, and therefore does not impact the cost of testing.

3. Additional Amendments

DOE has determined that the remainder of the amendments adopted in this final rule will not impact test costs.

DOE provides direction regarding the required settings for network capabilities during testing under both appendix D1 and appendix D2. This direction will not impact test costs as it provides further direction to the prior test procedure and does not require conducting an additional test. The amendment will not change the measured energy use of basic models for which the consumer is required to turn on the network capability, as the prior test procedure provided no direction to do so. To the extent that there are basic models with the network capability enabled in the as shipped condition, the energy use attributable to the network function would have been captured under the prior test procedure. For any such basic models, the direction regarding the network capabilities adopted in this document will result in lower measured energy use as compared to the prior test procedure. Therefore, the amendment regarding network capabilities adopted in this final rule will not result in a basic model that is complaint under the prior test procedure becoming non-compliant.

DOE provides additional direction on the dryness level setting for clothes dryers that provide an even number of discrete dryness settings. This amendment impacts only appendix D2, and therefore has no impact on testing under appendix D1. This amendment will not impact testing costs, as it provides direction for the required setting for the previously required test, without requiring any additional testing.

DOE is updating the representative annual number of drying cycles in the per-cycle standby mode and off mode energy consumption calculations in appendix D2 to use the most recently available data. The updated number of drying cycles will not be required for use unless and until such time the energy conservation standards are amended taking into account the updated value. As such, this amendment will not require retesting or recertification.

DOE provides revisions regarding the measurement and accounting of standby mode and off mode power in both appendix D1 and appendix D2. DOE has determined that these revisions potentially reduce testing costs for third-party laboratories, as the amendment does not require any disassembly of a clothes dryer to determine the appropriate application of the test procedure. However, DOE has not quantified the potential reduction in testing cost.

DOE provides a variety of formatting and typographical corrections to both appendix D1 and appendix D2. These edits remove confusion that may result from the errors and improve the readability of the test procedures.

DOE amends 10 CFR 430.23(d) to include instructions for calculating estimated annual operating cost, CEF, and other useful metrics using appendix D2. The prior test procedure provision provided for the calculation of these values using measurements from appendix D1. The test procedure as finalized in this document also explicitly provides for calculating these values using measurements from appendix D2. This amendment provides additional direction regarding the calculation of metrics and no additional testing will be required.

DOE is revising the required weighing scale resolution for weighing test cloths to limit test variation consistent with current test laboratory capabilities. In DOE's experience, testing facilities are currently using instrumentation that meet these new instrumentation requirements, and therefore DOE concludes that these revisions will not impact test burden.

Manufacturers will be able to rely on data generated under the previous test procedure, and no retesting or recertification will be required as a result of this test procedure.

H. Harmonization with Industry Standards

The test procedures for clothes dryers in appendix D1 and appendix D2 incorporate by reference AHAM HLD-1-2009, "Household Tumble Type Clothes Dryers," (which was later certified as ANSI/AHAM HLD-1-2010) and IEC Standard 62301. Specifically, both appendices reference an exhaust simulator specified in AHAM HLD-1-2009 in their test setup instructions, and incorporate IEC Standard 62301, which provides test conditions, testing equipment, and methods for measuring standby mode and off mode power consumption. Appendix D1 and appendix D2 also require the use of

AHAM Standard Test Detergent Formula 3 for preconditioning the test cloths. DOE has determined that the revisions to the standby and off mode power provisions do not impact the existing references to industry standards and do not alter the applicability of those referenced industry standards to the DOE test procedure.

The California IOUs suggested that DOE review comments they submitted in response to the NOPR published on February 13, 2019, proposing amendments to DOE's rulemaking process (84 FR 3910); specifically, their recommendation that DOE use industry-based test procedures as guidance documents and that all industry test procedures should be evaluated consistent with EPCA. (California IOUs, No. 29 at p. 21) AHAM supported the practice of adopting voluntary consensus-based test procedures without modification, specifically the incorporation by reference of the latest version of AHAM HLD-1, though AHAM did not support incorporation by reference of IEC Standard 61121. AHAM commented that, while there may be times when it is appropriate to incorporate European standards by reference, in this case the European procedure does not produce results that are directly comparable to the DOE test procedure results. (AHAM, No. 33 at p. 13)

In conducting this test procedure rulemaking, DOE reviewed relevant industry standards, including AHAM HLD-1 and IEC Standard 61121. The DOE test procedure continues to reference AHAM HLD-1. Because adoption of AHAM HLD-1 in its entirety would impact the measured energy use of clothes dryers for purposes of determining compliance with DOE standards, DOE did not amend appendix D1 or appendix D2 to adopt AHAM HLD-1 in its entirety in this rulemaking. Consistent with its 2020 amendments to the Process Rule at 10 CFR part 430, Subpart C, Appendix A, DOE will, however, consider adoption of AHAM HLD-1 in its entirety in a subsequent

rulemaking prior to any rulemaking to consider whether to amend the energy conservation standards applicable to clothes dryers.

As noted, the 2009 version of AHAM HLD-1 has been certified as ANSI/AHAM HLD-1-2010. ANSI certification ensures that the standard has been developed through a process that meets ANSI's requirements for openness, balance, consensus, and other due process safeguards.⁵³ The certification of AHAM HLD-1 as ANSI/AHAM HLD-1-2010 does not result in any substantive changes to the industry standard. In this final rule, DOE is updating the reference to AHAM HLD-1 in appendix D1 and appendix D2 to the 2010 version of ANSI/AHAM HLD-1. This update to the most recent version of AHAM HLD-1 does not result in any changes to the clothes dryer test procedures at appendix D1 and appendix D2.

I. Effective and Compliance Dates

The effective date for the adopted test procedure amendments will be 30 days after publication of this final rule in the *Federal Register*. EPCA prescribes that all representations of energy efficiency and energy use, including those made on marketing materials and product labels, must be made in accordance with an amended test procedure, beginning 180 days after publication of the final rule in the *Federal Register*. (42 U.S.C. 6293(c)(2)) EPCA allows individual manufacturers to petition DOE for an extension of the 180-day period if the manufacturer may experience undue hardship in meeting the deadline. (42 U.S.C. 6293(c)(3)) To receive such an extension, petitions must be filed with DOE no later than 60 days before the end of the 180-day period and must detail how the manufacturer will experience undue hardship. *Id.* To the extent the modified test procedure adopted in this final rule is required only for the evaluation and

⁵³ More information on ANSI's standards process may be found at: www.ansi.org/standards_activities/overview/overview?menuid=3

issuance of updated efficiency standards, compliance with the amended test procedure does not require use of such modified test procedure provisions until the implementation date of updated standards.

In addition, DOE amends the introductory note in both appendix D1 and appendix D2 to remove reference to the optional early use of the test procedures before the compliance date of the current clothes dryer energy conservation standards, which was January 1, 2015.

IV. Procedural Issues and Regulatory Review

A. Review Under Executive Order 12866

The Office of Management and Budget (“OMB”) has determined that this test procedure rulemaking is not a “significant regulatory action” under section 3(f) of Executive Order (“E.O.”) 12866, Regulatory Planning and Review, 58 FR 51735 (Oct. 4, 1993). Accordingly, this action was not subject to review under the E.O. by the Office of Information and Regulatory Affairs (“OIRA”) in OMB.

B. Review Under the Regulatory Flexibility Act

The Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*) requires preparation of a final regulatory flexibility analysis (“FRFA”) for any final rule where the agency was first required by law to publish a proposed rule for public comment, unless the agency certifies that the rule, if promulgated, will not have a significant economic impact on a substantial number of small entities. As required by E.O. 13272, “Proper Consideration of Small Entities in Agency Rulemaking,” 67 FR 53461 (August 16, 2002), DOE published procedures and policies on February 19, 2003 to ensure that the potential

impacts of its rules on small entities are properly considered during the DOE rulemaking process. 68 FR 7990. DOE has made its procedures and policies available on the Office of the General Counsel's website: <https://energy.gov/gc/office-general-counsel>.

DOE reviewed this final rule under the provisions of the Regulatory Flexibility Act and the procedures and policies published on February 19, 2003. DOE has concluded that this final rule will not have a significant impact on a substantial number of small entities. The factual basis for this determination is as follows:

The Small Business Administration ("SBA") considers a business entity to be a small business, if, together with its affiliates, it employs less than a threshold number of workers or earns less than the average annual receipts specified in 13 CFR part 121. The threshold values set forth in these regulations use size standards and codes established by the North American Industry Classification System ("NAICS") that are available at: www.sba.gov/document/support--table-size-standards. The threshold number for NAICS classification code 335220, major household appliance manufacturing, which includes clothes dryer manufacturers, is 1,500 employees.

Most of the manufacturers supplying clothes dryers are large multinational corporations. DOE collected data from DOE's compliance certification database⁵⁴ and surveyed the AHAM member directory to identify manufacturers of clothes dryers. DOE then consulted publicly-available data, purchased company reports from vendors such as Dun and Bradstreet, and contacted manufacturers, where needed, to determine if they meet the SBA's definition of a "small business manufacturing facility" and have their manufacturing facilities located within the United States. Based on this analysis, DOE

⁵⁴ www.regulations.doe.gov/certification-data (Last accessed February 2, 2019).

did not identify any small businesses that manufacture clothes dryers covered by the proposed test procedure amendments.

Additionally, as described in section III.G of this document, the amendments proposed in this test procedure will not increase costs to clothes dryer manufacturers. Therefore, DOE concludes that the cost effects accruing from the final rule will not have a “significant economic impact on a substantial number of small entities,” and that the preparation of a FRFA is not warranted. DOE has submitted a certification and supporting statement of factual basis to the Chief Counsel for Advocacy of the Small Business Administration for review under 5 U.S.C. 605(b).

C. Review Under the Paperwork Reduction Act of 1995

Manufacturers of clothes dryers must certify to DOE that their products comply with any applicable energy conservation standards. To certify compliance, manufacturers must first obtain test data for their products according to the DOE test procedures, including any amendments adopted for those test procedures. DOE has established regulations for the certification and recordkeeping requirements for all covered consumer products and commercial equipment, including clothes dryers. (See generally 10 CFR part 429) The collection-of-information requirement for the certification and recordkeeping is subject to review and approval by OMB under the Paperwork Reduction Act (“PRA”). This requirement has been approved by OMB under OMB control number 1910-1400. Public reporting burden for the certification is estimated to average 35 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

Notwithstanding any other provision of the law, no person is required to respond to, nor shall any person be subject to a penalty for failure to comply with, a collection of information subject to the requirements of the PRA, unless that collection of information displays a currently valid OMB Control Number.

D. Review Under the National Environmental Policy Act of 1969

In this final rule, DOE establishes test procedure amendments that it expects will be used to develop and implement future energy conservation standards for clothes dryers. DOE has determined that this rule falls into a class of actions that are categorically excluded from review under the National Environmental Policy Act of 1969 (42 U.S.C. 4321 *et seq.*) and DOE's implementing regulations at 10 CFR part 1021. Specifically, DOE has determined that adopting test procedures for measuring energy efficiency of consumer products and industrial equipment is consistent with activities identified in 10 CFR part 1021, appendix A to subpart D, A5 and A6. Accordingly, neither an environmental assessment nor an environmental impact statement is required.

E. Review Under Executive Order 13132

E.O. 13132, "Federalism," 64 FR 43255 (August 4, 1999), imposes certain requirements on agencies formulating and implementing policies or regulations that preempt State law or that have federalism implications. The E.O. requires agencies to examine the constitutional and statutory authority supporting any action that would limit the policymaking discretion of the States and to carefully assess the necessity for such actions. The E.O. also requires agencies to have an accountable process to ensure meaningful and timely input by State and local officials in the development of regulatory policies that have federalism implications. On March 14, 2000, DOE published a statement of policy describing the intergovernmental consultation process it will follow

in the development of such regulations. 65 FR 13735. DOE examined this final rule and determined that it will not have a substantial direct effect on the States, on the relationship between the National Government and the States, or on the distribution of power and responsibilities among the various levels of government. EPCA governs and prescribes Federal preemption of State regulations as to energy conservation for the products that are the subject of this final rule. States can petition DOE for exemption from such preemption to the extent, and based on criteria, set forth in EPCA. (42 U.S.C. 6297(d)) No further action is required by E.O. 13132.

F. Review Under Executive Order 12988

Regarding the review of existing regulations and the promulgation of new regulations, section 3(a) of E.O. 12988, “Civil Justice Reform,” 61 FR 4729 (Feb. 7, 1996), imposes on Federal agencies the general duty to adhere to the following requirements: (1) eliminate drafting errors and ambiguity; (2) write regulations to minimize litigation; (3) provide a clear legal standard for affected conduct rather than a general standard; and (4) promote simplification and burden reduction. Section 3(b) of E.O. 12988 specifically requires that executive agencies make every reasonable effort to ensure that the regulation (1) clearly specifies the preemptive effect, if any; (2) clearly specifies any effect on existing Federal law or regulation; (3) provides a clear legal standard for affected conduct while promoting simplification and burden reduction; (4) specifies the retroactive effect, if any; (5) adequately defines key terms; and (6) addresses other important issues affecting clarity and general draftsmanship under any guidelines issued by the Attorney General. Section 3(c) of E.O. 12988 requires executive agencies to review regulations in light of applicable standards in sections 3(a) and 3(b) to determine whether they are met or it is unreasonable to meet one or more of them. DOE

has completed the required review and determined that, to the extent permitted by law, this final rule meets the relevant standards of E.O. 12988.

G. Review Under the Unfunded Mandates Reform Act of 1995

Title II of the Unfunded Mandates Reform Act of 1995 (“UMRA”) requires each Federal agency to assess the effects of Federal regulatory actions on State, local, and Tribal governments and the private sector. Pub. L. 104-4, sec. 201 (codified at 2 U.S.C. 1531). For a regulatory action resulting in a rule that may cause the expenditure by State, local, and Tribal governments, in the aggregate, or by the private sector of \$100 million or more in any one year (adjusted annually for inflation), section 202 of UMRA requires a Federal agency to publish a written statement that estimates the resulting costs, benefits, and other effects on the national economy. (2 U.S.C. 1532(a), (b)) The UMRA also requires a Federal agency to develop an effective process to permit timely input by elected officers of State, local, and Tribal governments on a proposed “significant intergovernmental mandate,” and requires an agency plan for giving notice and opportunity for timely input to potentially affected small governments before establishing any requirements that might significantly or uniquely affect small governments. On March 18, 1997, DOE published a statement of policy on its process for intergovernmental consultation under UMRA. 62 FR 12820; also available at <https://energy.gov/gc/office-general-counsel>. DOE examined this final rule according to UMRA and its statement of policy and determined that the rule contains neither an intergovernmental mandate, nor a mandate that may result in the expenditure of \$100 million or more in any year, so these requirements do not apply.

H. Review Under the Treasury and General Government Appropriations Act, 1999

Section 654 of the Treasury and General Government Appropriations Act, 1999 (Pub. L. 105-277) requires Federal agencies to issue a Family Policymaking Assessment for any rule that may affect family well-being. This final rule will not have any impact on the autonomy or integrity of the family as an institution. Accordingly, DOE has concluded that it is not necessary to prepare a Family Policymaking Assessment.

I. Review Under Executive Order 12630

DOE has determined, under E.O. 12630, “Governmental Actions and Interference with Constitutionally Protected Property Rights” 53 FR 8859 (March 18, 1988), that this regulation will not result in any takings that might require compensation under the Fifth Amendment to the U.S. Constitution.

J. Review Under Treasury and General Government Appropriations Act, 2001

Section 515 of the Treasury and General Government Appropriations Act, 2001 (44 U.S.C. 3516 note) provides for agencies to review most disseminations of information to the public under guidelines established by each agency pursuant to general guidelines issued by OMB. OMB’s guidelines were published at 67 FR 8452 (Feb. 22, 2002), and DOE’s guidelines were published at 67 FR 62446 (Oct. 7, 2002). Pursuant to OMB Memorandum M-19-15, Improving Implementation of the Information Quality Act (April 24, 2019), DOE published updated guidelines which are available at www.energy.gov/sites/prod/files/2019/12/f70/DOE%20Final%20Updated%20IQA%20Guidelines%20Dec%202019.pdf. DOE has reviewed this final rule under the OMB and DOE guidelines and has concluded that it is consistent with applicable policies in those guidelines.

K. Review Under Executive Order 13211

E.O. 13211, “Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use,” 66 FR 28355 (May 22, 2001), requires Federal agencies to prepare and submit to OMB, a Statement of Energy Effects for any significant energy action. A “significant energy action” is defined as any action by an agency that promulgated or is expected to lead to promulgation of a final rule, and that (1) is a significant regulatory action under E.O. 12866, or any successor order; and (2) is likely to have a significant adverse effect on the supply, distribution, or use of energy; or (3) is designated by the Administrator of OIRA as a significant energy action. For any significant energy action, the agency must give a detailed statement of any adverse effects on energy supply, distribution, or use if the regulation is implemented, and of reasonable alternatives to the action and their expected benefits on energy supply, distribution, and use.

This regulatory action is not a significant regulatory action under E.O. 12866. Moreover, it will not have a significant adverse effect on the supply, distribution, or use of energy, nor has it been designated as a significant energy action by the Administrator of OIRA. Therefore, it is not a significant energy action, and, accordingly, DOE has not prepared a Statement of Energy Effects.

L. Review Under Section 32 of the Federal Energy Administration Act of 1974

Under section 301 of the Department of Energy Organization Act (Pub. L. 95–91; 42 U.S.C. 7101), DOE must comply with section 32 of the Federal Energy Administration Act of 1974, as amended by the Federal Energy Administration Authorization Act of 1977. (15 U.S.C. 788; “FEAA”) Section 32 essentially provides in relevant part that, where a proposed rule authorizes or requires use of commercial standards, the notice of proposed rulemaking must inform the public of the use and

background of such standards. In addition, section 32(c) requires DOE to consult with the Attorney General and the Chairman of the FTC concerning the impact of the commercial or industry standards on competition.

The modifications to the test procedure for clothes dryers adopted in this final rule incorporates testing methods contained in the following commercial standards: AHAM HLD-1-2010, IEC 62301 (Edition 2.0, 2011-01). DOE has evaluated these standard and is unable to conclude whether it fully complies with the requirements of section 32(b) of the FEAA (*i.e.*, whether it was developed in a manner that fully provides for public participation, comment, and review.) DOE has consulted with both the Attorney General and the Chairman of the FTC about the impact on competition of using the methods contained in these standards and has received no comments objecting to their use.

M. Congressional Notification

As required by 5 U.S.C. 801, DOE will report to Congress on the promulgation of this rule before its effective date. The report will state that it has been determined that the rule is not a "major rule" as defined by 5 U.S.C. 804(2).

N. Description of Materials Incorporated by Reference

In this final rule, DOE incorporates by reference the industry standard published by AHAM, titled "ANSI/AHAM HLD-1-2010 ("AHAM HLD-1-2010"), Household Tumble Type Clothes Dryers, approved 2010" which provides methods for testing and evaluating performance (*i.e.*, moisture removal energy efficiency, drying time, and clothing load temperatures) of home laundry clothes drying equipment. Copies of ANSI/AHAM HLD-1-2010 can be obtained from the Association of Home Appliance Manufacturers at 1111 19th Street NW, Suite 402, Washington, DC 20036, 202-872-

5955, or go to *www.aham.org*. Specifically, the test procedure codified by this final rule references section 3.3.5.1 “Standard Simulator” of AHAM HLD-1-2010, which provides specifications for an exhaust simulator.

In this final rule DOE maintains the incorporation by reference to a test procedure published by IEC, titled IEC 62301, “Household electrical appliances-Measurement of standby power”, (Edition 2.0, 2011-01) (“IEC 62301”). Copies of IEC 62301 can be obtained from the International Electrotechnical Commission webstore, by going to *https://webstore.iec.ch*. Specifically, the test procedure codified by this final rule references Section 5, Paragraph 5.1 “General,” Note 1 and Section 5, Paragraph 5.3.2 “Sampling Method” of IEC 62301, which provides test conditions, testing equipment, and methods for measuring standby mode and off mode power consumption.

V. Approval of the Office of the Secretary

The Secretary of Energy has approved publication of this final rule.

List of Subjects

10 CFR Part 429

Administrative practice and procedure, Confidential business information, Energy conservation, Household appliances, Reporting and recordkeeping requirements.

10 CFR Part 430

Administrative practice and procedure, Confidential business information, Energy conservation, Household appliances, Imports, Incorporation by reference, Intergovernmental relations, Small businesses.

Signing Authority

This document of the Department of Energy was signed on October 1, 2021, by Kelly Speakes-Backman, Principal Deputy Assistant Secretary and Acting Assistant Secretary for Energy Efficiency and Renewable Energy, pursuant to delegated authority from the Secretary of Energy. That document with the original signature and date is maintained by DOE. For administrative purposes only, and in compliance with requirements of the Office of the Federal Register, the undersigned DOE Federal Register Liaison Officer has been authorized to sign and submit the document in electronic format for publication, as an official document of the Department of Energy. This administrative process in no way alters the legal effect of this document upon publication in the *Federal Register*.

Signed in Washington, DC, on October 1, 2021.

Treena V. Garrett,
Federal Register Liaison Officer,
U.S. Department of Energy.

For the reasons stated in the preamble, DOE amends parts 429 and 430 of chapter II of title 10, Code of Federal Regulations as set forth below:

**PART 429—CERTIFICATION, COMPLIANCE, AND ENFORCEMENT FOR
CONSUMER PRODUCTS AND COMMERCIAL AND INDUSTRIAL
EQUIPMENT**

1. The authority citation for part 429 continues to read as follows:

Authority: 42 U.S.C. 6291–6317; 28 U.S.C. 2461 note.

2. Section 429.21 is amended by revising paragraph (b)(2) and adding paragraph (c) to read as follows:

§ 429.21 Residential clothes dryers.

* * * * *

(b) * * *

(2) Pursuant to §429.12(b)(13), a certification report shall include the following public product-specific information: When using appendix D1 to subpart B of part 430 of this chapter, the combined energy factor in pounds per kilowatt hours (lb/kWh), the capacity in cubic feet (cu ft), the voltage in volts (V) (for electric dryers only), an indication if the dryer has automatic termination controls, and the hourly Btu rating of the burner (for gas dryers only); when using appendix D2 to subpart B of part 430, the combined energy factor in pounds per kilowatt hours (lb/kWh), the capacity in cubic feet (cu ft), the voltage in volts (V) (for electric dryers only), an indication if the dryer has automatic termination controls, the hourly Btu rating of the burner (for gas dryers only), and a list of the cycle setting selections for the energy test cycle as recorded in section 3.4.7 of appendix D2 to subpart B of part 430.

(c) *Reported values.* Values reported pursuant to this section must be rounded as follows: CEF to the nearest 0.01 lb/kWh, capacity to the nearest 0.1 cu ft, voltage to the nearest V, and hourly Btu rating to the nearest Btu.

PART 430—ENERGY CONSERVATION PROGRAM FOR CONSUMER PRODUCTS

3. The authority citation for part 430 continues read as follows:

Authority: 42 U.S.C. 6291–6309; 28 U.S.C. 2461 note.

4. Section 430.3 is amended by revising paragraph (i)(3) to read as follows:

§430.3 Materials incorporated by reference.

* * * * *

(i) * * *

(3) ANSI/AHAM HLD-1-2010 (“AHAM HLD-1”), Household Tumble Type Clothes Dryers, ANSI-approved June 11, 2010, IBR approved for appendices D1 and D2 to subpart B of this part.

* * * * *

5. Section 430.23 is amended by revising paragraph (d) to read as follows:

§430.23 Test procedures for the measurement of energy and water consumption.

* * * * *

(d) *Clothes dryers.* (1) The estimated annual energy consumption for clothes dryers, expressed in kilowatt-hours per year, shall be the product of the annual

representative average number of clothes dryer cycles as specified in appendix D1 or D2 to this subpart, as appropriate, and the per-cycle combined total energy consumption in kilowatt-hours per cycle, determined according to section 4.6 of appendix D1 or section 4.6 of appendix D2 to this subpart, as appropriate.

(2) The estimated annual operating cost for clothes dryers shall be—

(i) For an electric clothes dryer, the product of the following three factors, with the resulting product then being rounded off to the nearest dollar per year:

(A) The annual representative average number of clothes dryer cycles as specified in appendix D1 or appendix D2 to this subpart, as appropriate;

(B) The per-cycle combined total energy consumption in kilowatt-hours per cycle, determined according to section 4.6 of appendix D1 or section 4.6 of appendix D2 to this subpart, as appropriate; and

(C) The representative average unit cost of electrical energy in dollars per kilowatt-hour as provided by the Secretary; and

(ii) For a gas clothes dryer, the product of the annual representative average number of clothes dryer cycles as specified in appendix D1 or D2 to this subpart, as appropriate, times the sum of the following three factors, with the resulting product then being rounded off to the nearest dollar per year:

(A) The product of the per-cycle gas dryer electric energy consumption in kilowatt-hours per cycle, determined according to section 4.2 of appendix D1 or section 4.2 of appendix D2 to this subpart, as appropriate, times the representative average unit cost of electrical energy in dollars per kilowatt-hour as provided by the Secretary; plus,

(B) The product of the per-cycle gas dryer gas energy consumption, in Btus per cycle, determined according to section 4.3 of appendix D1 or section 4.3 of appendix D2 to this subpart, as appropriate, times the representative average unit cost for natural gas or propane, as appropriate, in dollars per Btu as provided by the Secretary; plus,

(C) The product of the per-cycle standby mode and off mode energy consumption in kilowatt-hours per cycle, determined according to section 4.5 of appendix D1 or section 4.5 of appendix D2 to this subpart, as appropriate, times the representative average unit cost of electrical energy in dollars per kilowatt-hour as provided by the Secretary.

(3) The combined energy factor, expressed in pounds per kilowatt-hour is determined in accordance with section 4.7 of appendix D1 or section 4.7 of appendix D2 to this subpart, as appropriate, the result then being rounded off to the nearest hundredth (0.01).

(4) Other useful measures of energy consumption for clothes dryers shall be those measures of energy consumption for clothes dryers which the Secretary determines are likely to assist consumers in making purchasing decisions and which are derived from the application of appendix D1 or D2 to this subpart, as appropriate.

* * * * *

Appendix D to Subpart B of Part 430—[Removed]

6. Appendix D to subpart B of part 430 is removed.

7. Appendix D1 to subpart B of part 430 is amended by:

- a. Revising the introductory note;
- b. Adding section 0;
- c. Revising section 1.3;
- d. Removing the word “clothes”, in section 1.5, and adding in its place “cloths”;
- e. Removing sections 1.7 and 1.14;
- f. Redesignating sections 1.8 through 1.11 as sections 1.7 through 1.10,

respectively, and section 1.13 as section 1.14;

- g. Adding new sections 1.11 and 1.13;
- h. Revising section 1.18;
- i. Revising the first sentence of section 2.1.1 and revising section 2.1.2;
- j. Revising the first sentence of section 2.1.3;
- k. Revising sections 2.2.1, 2.3.2.1, and 2.3.2.2;
- l. Adding section 2.3.2.3;
- m. Redesignating section 2.4.1 as section 2.4.1.1;
- n. Adding new section 2.4.1;
- o. Revising newly redesignated 2.4.1.1;
- p. Removing the word “Clothes”, in section 2.6, and adding in its place “Cloths”;
- q. Revising sections 2.7.1, 2.7.2, and 2.8.1;
- r. In section 3.1, in the last sentence of the introductory text, adding the text “to the nearest 0.1 cubic foot” following the text “is calculated”;
- s. Revising sections 3.3, 3.4.1, 3.4.2, 3.4.3, 3.6, 3.6.1, and 3.6.2;
- t. Adding sections 3.6.3 and 3.6.4;
- u. Revising sections 4.1, 4.2, 4.3, and 4.5;
- v. Removing section 4.7; and
- w. Redesignating section 4.8 as section 4.7.

The revisions and additions read as follows:

Appendix D1 to Subpart B of Part 430—Uniform Test Method for Measuring the Energy Consumption of Clothes Dryers

Note: The procedures in either this appendix or appendix D2 to this subpart must be used to determine compliance with energy conservation standards for clothes dryers manufactured on or after January 1, 2015. Manufacturers must use a single appendix for

all representations, including certifications of compliance, and may not use this appendix for certain representations and appendix D2 to this subpart for other representations.

0. Incorporation by Reference

DOE incorporated by reference in § 430.3 the standards for AHAM HLD-1 and IEC 62301, in their entirety, however, only enumerated provisions of those documents are applicable to this appendix. In cases where there is a conflict between any industry standard(s) and this appendix, the language of the test procedure in this appendix takes precedence over the industry standard(s).

(1) AHAM HLD-1:

(i) Section 3.3.5.1 “Standard Simulator” as referenced in sections 2.1.2 through 2.1.3 of this appendix.

(ii) [Reserved]

(2) IEC 62301:

(i) Section 5, Paragraph 5.1, Note 1 as referenced in section 3.6.2 of this appendix.

(ii) Section 5, Paragraph 5.3.2 “Sampling Method” as referenced in section 3.6.3 of this appendix.

1. * * *

1.3 “AHAM HLD-1” means the test standard published by the Association of Home Appliance Manufacturers, titled “Household Tumble Type Clothes Dryers,” ANSI-approved June 11, 2010, ANSI/AHAM HLD-1-2010.

* * * * *

1.11 “Final moisture content” (“FMC”) means the ratio of the weight of water contained by the dry test load (*i.e.*, after completion of the drying cycle) to the bone-dry weight of the test load, expressed as a percent.

* * * * *

1.13 “Initial moisture content” (“IMC”) means the ratio of the weight of water contained by the damp test load (*i.e.*, prior to completion of the drying cycle) to the bone-dry weight of the test load, expressed as a percent.

* * * *

1.18 “Vented clothes dryer” means a clothes dryer that exhausts the evaporated moisture from the cabinet.

* * * *

2. * * *

2.1.1 * * * For both vented clothes dryers and ventless clothes dryers, install the clothes dryer in accordance with manufacturer's instructions as shipped with the unit. * * *

2.1.2 *Vented clothes dryers.* For vented clothes dryers, the dryer exhaust shall be restricted by adding the AHAM exhaust simulator described in section 3.3.5.1 of AHAM HLD-1.

2.1.3 * * * For ventless clothes dryers, the dryer shall be tested without the AHAM exhaust simulator. * * *

* * * *

2.2.1 For drying testing, maintain the room ambient air temperature at 75 ± 3 °F and the room relative humidity at 50 percent ± 10 percent relative humidity.

* * * *

2.3.2.1 *Natural gas supply.* Maintain the gas supply to the clothes dryer immediately ahead of all controls at a pressure of 7 to 10 inches of water column. The natural gas supplied should have a heating value of approximately 1,025 Btus per standard cubic foot. The actual heating value, H_n , in Btus per standard cubic foot, for the natural gas to be used in the test shall be obtained either from measurements using a standard continuous flow calorimeter as described in section 2.4.6 of this appendix or by the purchase of bottled natural gas whose Btu rating is certified to be at least as accurate a

rating as could be obtained from measurements with a standard continuous flow calorimeter as described in section 2.4.6 of this appendix.

2.3.2.2 Propane gas supply. Maintain the gas supply to the clothes dryer immediately ahead of all controls at a pressure of 11 to 13 inches of water column. The propane gas supplied should have a heating value of approximately 2,500 Btus per standard cubic foot. The actual heating value, H_p , in Btus per standard cubic foot, for the propane gas to be used in the test shall be obtained either from measurements using a standard continuous flow calorimeter as described in section 2.4.6 of this appendix or by the purchase of bottled gas whose Btu rating is certified to be at least as accurate a rating as could be obtained from measurement with a standard continuous calorimeter as described in section 2.4.6 of this appendix.

2.3.2.3 Hourly Btu Rating. Maintain the hourly Btu rating of the burner within ± 5 percent of the rating specified by the manufacturer. If the hourly Btu rating of the burner cannot be maintained within ± 5 percent of the rating specified by the manufacturer, make adjustments in the following order until an hourly Btu rating of the burner within ± 5 percent of the rating specified by the manufacturer is achieved:

- (1) Modify the gas inlet supply pressure within the allowable range specified in section 2.3.2.1 or 2.3.2.2 of this appendix, as applicable;
- (2) If the clothes dryer is equipped with a gas pressure regulator, modify the outlet pressure of the gas pressure regulator within ± 10 percent of the value recommended by the manufacturer in the installation manual, on the nameplate sticker, or wherever the manufacturer makes such a recommendation for the basic model; and
- (3) Modify the orifice as necessary to achieve the required hourly Btu rating.

* * * *

2.4.1 Weighing scales.

2.4.1.1 Weighing scale for test cloth. The scale shall have a range of 0 to a maximum of

60 pounds with a resolution of at least 0.001 pounds and a maximum error no greater than 0.1 percent of any measured value within the range of 3 to 15 pounds.

* * * *

2.7.1 *Load size.* Determine the load size for the unit under test, according to Table 1 of this section.

Table 1—Test Loads

Unit Under Test	Test Load (Bone Dry Weight)
Standard size clothes dryer	8.45 pounds \pm .085 pounds
Compact size clothes dryer	3.00 pounds \pm .03 pounds

Each test load must consist of energy test cloths and no more than five energy stuffer cloths.

2.7.2 *Test load preparation.* Dampen the load by agitating it in water whose temperature is $60^{\circ}\text{F} \pm 5^{\circ}\text{F}$ and consists of 0 to 17 parts per million hardness for approximately 2 minutes in order to saturate the fabric. Then, extract water from the wet test load by spinning the load to a target moisture content between 54.0-61.0 percent of the bone-dry weight of the test load. If after extraction the moisture content is less than 54.0 percent, make a final mass adjustment, such that the moisture content is between 54.0-61.0 percent of the bone-dry weight of the test load, by adding water uniformly distributed among all of the test cloths in a very fine spray using a spray bottle.

* * * *

2.8.1 *Vented clothes dryers.* For vented clothes dryers, before any test cycle, operate the dryer without a test load in the non-heat mode for 15 minutes or until the discharge air temperature is varying less than 1°F for 10 minutes—whichever is longer—in the test installation location with the ambient conditions within the specified test condition tolerances of section 2.2 of this appendix.

* * * *

3. * * *

3.3 *Test cycle.* Operate the clothes dryer at the maximum temperature setting and, if equipped with a timer, at the maximum time setting. Any other optional cycle settings that do not affect the temperature or time settings shall be tested in the as-shipped position, except that if the clothes dryer has network capabilities, the network settings must be disabled throughout testing if such settings can be disabled by the end-user and the product's user manual provides instructions on how to do so. If the network settings cannot be disabled by the end-user, or the product's user manual does not provide instruction for disabling network settings, then the unit must be tested with the network settings in the factory default configuration for the test cycle. If the clothes dryer does not have a separate temperature setting selection on the control panel, the maximum time setting should be used for the drying test cycle. Dry the load until the moisture content of the test load is between 2.5 and 5.0 percent of the bone-dry weight of the test load, at which point the test cycle is stopped, but do not permit the dryer to advance into cool down. If required, reset the timer to increase the length of the drying cycle. After stopping the test cycle, remove and weigh the test load within 5 minutes following termination of the test cycle. The clothes dryer shall not be stopped intermittently in the middle of the test cycle for any reason. Record the data specified by section 3.4 of this appendix. If the dryer automatically stops during a cycle because the condensation box is full of water, the test is stopped, and the test run is invalid, in which case the condensation box shall be emptied and the test re-run from the beginning. For ventless clothes dryers, during the time between two cycles, the door of the dryer shall be closed except for loading and unloading.

* * * * *

3.4.1 Bone-dry weight of the test load, W_{bonedry} , as described in section 2.7.1 of this appendix.

3.4.2 Moisture content of the wet test load before the test, IMC, as described in section 2.7.2 of this appendix.

3.4.3 Moisture content of the dry test load obtained after the test, FMC, as described in section 3.3 of this appendix.

* * * * *

3.6 *Standby mode and off mode power.* Connect the clothes dryer to a watt meter as specified in section 2.4.7 of this appendix. Establish the testing conditions set forth in section 2 of this appendix.

3.6.1 Perform standby mode and off mode testing after completion of an active mode drying cycle included as part of the test cycle; after removing the test load; without changing the control panel settings used for the active mode drying cycle; with the door closed; and without disconnecting the electrical energy supply to the clothes dryer between completion of the active mode drying cycle and the start of standby mode and off mode testing.

3.6.2 For clothes dryers that take some time to automatically enter a stable inactive mode or off mode state from a higher power state as discussed in Section 5, Paragraph 5.1, Note 1 of IEC 62301, allow sufficient time for the clothes dryer to automatically reach the default inactive/off mode state before proceeding with the test measurement.

3.6.3 Once the stable inactive/off mode state has been reached, measure and record the default inactive/off mode power, P_{default} , in watts, following the test procedure for the sampling method specified in Section 5, Paragraph 5.3.2 of IEC 62301.

3.6.4 For a clothes dryer with a switch (or other means) that can be optionally selected by the end user to achieve a lower-power inactive/off mode state than the default inactive/off mode state measured in section 3.6.3 of this appendix, after performing the measurement in section 3.6.3 of this appendix, activate the switch (or other means) to the position resulting in the lowest power consumption and repeat the measurement procedure

described in section 3.6.3 of this appendix. Measure and record the lowest inactive/off mode power, P_{lowest} , in watts.

4. * * *

4.1 *Total per-cycle electric dryer energy consumption.* Calculate the total electric dryer energy consumption per cycle, E_{ce} , expressed in kilowatt-hours per cycle and defined as:

$$E_{\text{ce}} = [53.5/(\text{IMC} - \text{FMC})] \times E_t \times \text{field use},$$

Where:

E_t = the energy recorded in section 3.4.5 of this appendix.

53.5 = an experimentally established value for the percent reduction in the moisture content of the test load during a laboratory test cycle expressed as a percent.

field use = field use factor,

= 1.18 for clothes dryers with time termination control systems only without any automatic termination control functions.

= 1.04 for clothes dryers with automatic control systems that meet the requirements of the definition for automatic termination control in section 1.4 of this appendix, including those that also have a supplementary timer control, or that may also be manually controlled.

IMC = the moisture content of the wet test load as recorded in section 3.4.2 of this appendix.

FMC = the moisture content of the dry test load as recorded in section 3.4.3 of this appendix.

4.2 *Per-cycle gas dryer electrical energy consumption.* Calculate the gas dryer electrical energy consumption per cycle, E_{ge} , expressed in kilowatt-hours per cycle and defined as:

$$E_{\text{ge}} = [53.5/(\text{IMC} - \text{FMC})] \times E_{\text{te}} \times \text{field use},$$

Where:

E_{te} = the energy recorded in section 3.4.6.1 of this appendix.

field use, 53.5, MC_w , and MC_d as defined in section 4.1 of this appendix.

4.3 *Per-cycle gas dryer gas energy consumption.* Calculate the gas dryer gas energy consumption per cycle, E_{gg} , expressed in Btus per cycle and defined as:

$$E_{gg} = [53.5/(MC_w - MC_d)] \times E_{tg} \times \text{field use} \times GEF$$

Where:

E_{tg} = the energy recorded in section 3.4.6.2 of this appendix.

GEF = corrected gas heat value (Btu per cubic feet) as defined in section 3.4.6.3 of this appendix.

field use, 53.5, IMC, and FMC as defined in section 4.1 of this appendix.

* * * * *

4.5 *Per-cycle standby mode and off mode energy consumption.* Calculate the clothes dryer per-cycle standby mode and off mode energy consumption, E_{TSO} , expressed in kilowatt-hours per cycle and defined as:

$$E_{TSO} = [(P_{\text{default}} \times S_{\text{default}}) + (P_{\text{lowest}} \times S_{\text{lowest}})] \times K/283$$

Where:

P_{default} = Default inactive/off mode power, in watts, as measured in section 3.6.3 of this appendix.

P_{lowest} = Lowest inactive/off mode power, in watts, as measured in section 3.6.4 of this appendix for clothes dryer with a switch (or other means) that can be optionally selected by the end user to achieve a lower-power inactive/off mode than the default inactive/off mode; otherwise, $P_{\text{lowest}}=0$.

S_{default} = Annual hours in default inactive/off mode, defined as 8,620 if no optional lowest-power inactive/off mode is available; otherwise 4,310.

S_{lowest} = Annual hours in lowest-power inactive/off mode, defined as 0 if no optional lowest-power inactive/off mode is available; otherwise 4,310.

K = Conversion factor of watt-hours to kilowatt-hours = 0.001.

283 = Representative average number of clothes dryer cycles in a year.

8,620 = Combined annual hours for inactive and off mode.

4,310 = One-half of the combined annual hours for inactive and off mode.

* * * *

8. Appendix D2 to subpart B of part 430 is amended by:

- a. Revising the introductory note;
- b. Adding section 0;
- c. Revising section 1.3;
- d. Removing the word “clothes”, in section 1.6, and adding in its place “cloths”;
- e. Removing sections 1.8, 1.15, and 1.19;
- f. Redesignating sections 1.9 through 1.11 as sections 1.8 through 1.10, sections 1.13 and 1.14 as sections 1.14 and 1.15, and section 1.20 as section 1.19;
- g. Adding new sections 1.11, 1.13, and 1.20;
- h. Removing the word “clasification”, in section 1.16, and adding in its place “classification”;
- i. Revising the first sentence of section 2.1.1 and revising section 2.1.2;
- j. Revising the first sentence of section 2.1.3;
- k. Revising sections 2.2.1, 2.3.2.1, and 2.3.2.2;
- l. Adding section 2.3.2.3;
- m. Redesignating section 2.4.1 as section 2.4.1.1;
- n. Adding new section 2.4.1;
- o. Revising newly redesignated 2.4.1.1;
- p. Revising sections 2.7.1, 2.7.2, and 2.8.1;
- q. In section 3.1, in the last sentence of the introductory text, adding the text “to the nearest 0.1 cubic foot” following the text “is calculated”;

- r. Revising sections 3.3.1, 3.3.2, 3.4.1, 3.4.2, and 3.4.3;
- s. Removing section 3.5;
- t. Redesignating sections 3.6, 3.6.1, and 3.6.2 as sections 3.5, 3.5.1, and 3.5.2, respectively;
- u. Revising newly redesignated sections 3.5, 3.5.1, and 3.5.2;
- v. Adding sections 3.5.3 and 3.5.4;
- w. Revising sections 4.1, 4.2, 4.3, 4.4, and 4.5;
- x. Adding section 4.5.1;
- y. Removing section 4.7; and
- z. Redesignating section 4.8 as section 4.7.

The revisions and additions read as follows:

Appendix D2 to Subpart B of Part 430—Uniform Test Method for Measuring the Energy Consumption of Clothes Dryer

Note: The procedures in either appendix D1 to this subpart or this appendix must be used to determine compliance with energy conservation standards for clothes dryers manufactured on or after January 1, 2015. Manufacturers must use a single appendix for all representations, including certifications of compliance, and may not use appendix D1 to this subpart for certain representations and this appendix for other representations. Per-cycle standby mode and off mode energy consumption in section 4.5 of this appendix is calculated using the value for the annual representative average number of clothes dryer cycles in a year specified in section 4.5.1(a) of this appendix until the compliance date of any amended energy conservation standards for these products. Beginning on the compliance date of any amended energy conservation standards for these products per-cycle standby mode and off mode energy consumption in section 4.5 of this appendix is

calculated using the value for the annual representative average number of clothes dryer cycles in a year specified in section 4.5.1(b) of this appendix.

0. Incorporation by Reference

DOE incorporated by reference in § 430.3 the entire standard for AHAM HLD-1 and IEC 62301, however, only enumerated provisions of those documents are applicable to this appendix. In cases where there is a conflict between any industry standard(s) and this appendix, the language of the test procedure in this appendix takes precedence over the industry standard(s).

(1) AHAM HLD-1:

(i) Section 3.3.5.1 “Standard Simulator” as referenced in sections 2.1.2 through 2.1.3 of this appendix.

(ii) [Reserved]

(2) IEC 62301:

(i) Section 5, Paragraph 5.1, Note 1 as referenced in section 3.5.2 of this appendix.

(ii) Section 5, Paragraph 5.3.2 “Sampling Method” as referenced in section 3.5.3 of this appendix.

* * * * *

1. * * *

1.3 “AHAM HLD-1” means the test standard published by the Association of Home Appliance Manufacturers, titled “Household Tumble Type Clothes Dryers,” ANSI-approved June 11, 2010, ANSI/AHAM HLD-1-2010.

* * * * *

1.11 “Final moisture content” (“FMC”) means the ratio of the weight of water contained by the dry test load (*i.e.*, after completion of the drying cycle) to the bone-dry weight of the test load, expressed as a percent.

* * * *

1.13 “Initial moisture content” (“IMC”) means the ratio of the weight of water contained by the damp test load (*i.e.*, prior to completion of the drying cycle) to the bone-dry weight of the test load, expressed as a percent.

* * * *

1.20 “Vented clothes dryer” means a clothes dryer that exhausts the evaporated moisture from the cabinet.

* * * *

2. * * *

2.1.1 * * * For both vented clothes dryers and ventless clothes dryers, install the clothes dryer in accordance with manufacturer's instructions as shipped with the unit. ***

2.1.2 *Vented clothes dryers.* For vented clothes dryers, the dryer exhaust shall be restricted by adding the AHAM exhaust simulator described in section 3.3.5.1 of AHAM HLD-1.

2.1.3 * * * For ventless clothes dryers, the dryer shall be tested without the AHAM exhaust simulator.* * *

* * * *

2.2.1 For drying testing, maintain the room ambient air temperature at 75 ± 3 F and the room relative humidity at 50 percent \pm 10 percent relative humidity.

* * * *

2.3.2.1 *Natural gas supply.* Maintain the gas supply to the clothes dryer immediately ahead of all controls at a pressure of 7 to 10 inches of water column. The natural gas supplied should have a heating value of approximately 1,025 Btus per standard cubic foot. The actual heating value, H_{n2} , in Btus per standard cubic foot, for the natural gas to be used in the test shall be obtained either from measurements using a standard continuous flow calorimeter as described in section 2.4.6 of this appendix or by the

purchase of bottled natural gas whose Btu rating is certified to be at least as accurate a rating as could be obtained from measurements with a standard continuous flow calorimeter as described in section 2.4.6 of this appendix.

2.3.2.2 *Propane gas supply.* Maintain the gas supply to the clothes dryer immediately ahead of all controls at a pressure of 11 to 13 inches of water column. The propane gas supplied should have a heating value of approximately 2,500 Btus per standard cubic foot. The actual heating value, H_p , in Btus per standard cubic foot, for the propane gas to be used in the test shall be obtained either from measurements using a standard continuous flow calorimeter as described in section 2.4.6 of this appendix or by the purchase of bottled gas whose Btu rating is certified to be at least as accurate a rating as could be obtained from measurement with a standard continuous calorimeter as described in section 2.4.6 of this appendix.

2.3.2.3 *Hourly Btu Rating.* Maintain the hourly Btu rating of the burner within ± 5 percent of the rating specified by the manufacturer. If the hourly Btu rating of the burner cannot be maintained within ± 5 percent of the rating specified by the manufacturer, make adjustments in the following order until an hourly Btu rating of the burner within ± 5 percent of the rating specified by the manufacturer is achieved:

- (1) Modify the gas inlet supply pressure within the allowable range specified in section 2.3.2.1 or 2.3.2.2 of this appendix, as applicable;
- (2) If the clothes dryer is equipped with a gas pressure regulator, modify the outlet pressure of the gas pressure regulator within ± 10 percent of the value recommended by the manufacturer in the installation manual, on the nameplate sticker, or wherever the manufacturer makes such a recommendation for the basic model; and
- (3) Modify the orifice as necessary to achieve the required hourly Btu rating.

* * * *

2.4.1 *Weighing scales.*

2.4.1.1 *Weighing scale for test cloth.* The scale shall have a range of 0 to a maximum of 60 pounds with a resolution of at least 0.001 pounds and a maximum error no greater than 0.1 percent of any measured value within the range of 3 to 15 pounds.

* * * *

2.7.1 *Load size.* Determine the load size for the unit under test, according to Table 1 of this section.

Table 1—Test Loads

Unit under Test	Test Load (bone dry weight)
Standard size clothes dryer	8.45 pounds \pm .085 pounds
Compact size clothes dryer	3.00 pounds \pm .03 pounds

Each test load must consist of energy test cloths and no more than five energy stuffer cloths.

2.7.2 *Test load preparation.* Dampen the load by agitating it in water whose temperature is 60 °F \pm 5 °F and consists of 0 to 17 parts per million hardness for approximately 2 minutes to saturate the fabric. Then, extract water from the wet test load by spinning the load until the moisture content of the load is between 52.5 and 57.5 percent of the bone-dry weight of the test load. Make a final mass adjustment, such that the moisture content is 57.5 percent \pm 0.33 percent by adding water uniformly distributed among all of the test cloths in a very fine spray using a spray bottle.

* * * *

2.8.1 *Vented clothes dryers.* For vented clothes dryers, before any test cycle, operate the dryer without a test load in the non-heat mode for 15 minutes or until the discharge air temperature is varying less than 1 °F for 10 minutes—whichever is longer—in the test installation location with the ambient conditions within the specified test condition tolerances of section 2.2 of this appendix.

* * * *

3. * * *

3.3.1 *Timer dryers.* For timer dryers, operate the clothes dryer at the maximum temperature setting and, if equipped with a timer, at the maximum time setting. Any other optional cycle settings that do not affect the temperature or time settings shall be tested in the as-shipped position, except that if the clothes dryer has network capabilities, the network settings must be disabled throughout testing if such settings can be disabled by the end-user and the product's user manual provides instructions on how to do so. If the network settings cannot be disabled by the end-user, or the product's user manual does not provide instruction for disabling network settings, then the unit must be tested with the network settings in the factory default configuration for the test cycle. If the clothes dryer does not have a separate temperature setting selection on the control panel, the maximum time setting should be used for the drying test cycle. Dry the load until the moisture content of the test load is between 1 and 2.5 percent of the bone-dry weight of the test load, at which point the test cycle is stopped, but do not permit the dryer to advance into cool down. If required, reset the timer to increase the length of the drying cycle. After stopping the test cycle, remove and weigh the test load within 5 minutes following termination of the test cycle. The clothes dryer shall not be stopped intermittently in the middle of the test cycle for any reason. Record the data specified by section 3.4 of this appendix. If the dryer automatically stops during a cycle because the condensation box is full of water, the test is stopped, and the test run is invalid, in which case the condensation box shall be emptied and the test re-run from the beginning. For ventless clothes dryers, during the time between two cycles, the door of the dryer shall be closed except for loading and unloading.

3.3.2 *Automatic termination control dryers.* For automatic termination control dryers, a "normal" program shall be selected for the test cycle. For dryers that do not have a "normal" program, the cycle recommended by the manufacturer for drying cotton or

linen clothes shall be selected. Where the drying temperature setting can be chosen independently of the program, it shall be set to the maximum. Where the dryness level setting can be chosen independently of the program, it shall be set to the “normal” or “medium” dryness level setting. If such designation is not provided, then the dryness level shall be set at the mid-point between the minimum and maximum settings. If an even number of discrete settings are provided, use the next-highest setting above the midpoint, in the direction of the maximum dryness setting or next-lowest setting below the midpoint, in the direction of the minimum dryness setting. Any other optional cycle settings that do not affect the program, temperature or dryness settings shall be tested in the as-shipped position, except that if the clothes dryer has network capabilities, the network settings must be disabled throughout testing if such settings can be disabled by the end-user and the product’s user manual provides instructions on how to do so. If the network settings cannot be disabled by the end-user, or the product’s user manual does not provide instruction for disabling network settings, then the unit must be tested with the network settings in the factory default configuration for the test cycle.

Operate the clothes dryer until the completion of the programmed cycle, including the cool down period. The cycle shall be considered complete when the dryer indicates to the user that the cycle has finished (by means of a display, indicator light, audible signal, or other signal) and the heater and drum/fan motor shuts off for the final time. If the clothes dryer is equipped with a wrinkle prevention mode (*i.e.*, that continuously or intermittently tumbles the clothes dryer drum after the clothes dryer indicates to the user that the cycle has finished) that is activated by default in the as-shipped position or if manufacturers' instructions specify that the feature is recommended to be activated for normal use, the cycle shall be considered complete after the end of the wrinkle prevention mode. After the completion of the test cycle, remove and weigh the test load within 5 minutes following termination of the test cycle. Record the data specified in section 3.4 of this

appendix. If the final moisture content is greater than 2 percent, the results from the test are invalid and a second run must be conducted. Conduct the second run of the test on the unit using the highest dryness level setting. If, on this second run, the dryer does not achieve a final moisture content of 2 percent or lower, the dryer has not sufficiently dried the clothes and the test results may not be used for certification of compliance with energy conservation standards. If the dryer automatically stops during a cycle because the condensation box is full of water, the test is stopped, and the test run is invalid, in which case the condensation box shall be emptied and the test re-run from the beginning. For ventless clothes dryers, during the time between two cycles, the door of the dryer shall be closed except for loading and unloading.

* * * * *

3.4.1 Bone-dry weight of the test load, W_{bonedry} , as described in section 2.7.1 of this appendix.

3.4.2 Moisture content of the wet test load before the test, IMC, as described in section 2.7.2 of this appendix.

3.4.3 Moisture content of the dry test load obtained after the test, FMC, as described in section 3.3 of this appendix.

* * * * *

3.5 *Standby mode and off mode power.* Connect the clothes dryer to a watt meter as specified in section 2.4.7 of this appendix. Establish the testing conditions set forth in section 2 of this appendix.

3.5.1 Perform standby mode and off mode testing after completion of an active mode drying cycle included as part of the test cycle; after removing the test load; without changing the control panel settings used for the active mode drying cycle; with the door closed; and without disconnecting the electrical energy supply to the clothes dryer

between completion of the active mode drying cycle and the start of standby mode and off mode testing.

3.5.2 For clothes dryers that take some time to automatically enter a stable inactive mode or off mode state from a higher power state as discussed in Section 5, Paragraph 5.1, Note 1 of IEC 62301, allow sufficient time for the clothes dryer to automatically reach the default inactive/off mode state before proceeding with the test measurement.

3.5.3 Once the stable inactive/off mode state has been reached, measure and record the default inactive/off mode power, P_{default} , in watts, following the test procedure for the sampling method specified in Section 5, Paragraph 5.3.2 of IEC 62301.

3.5.4 For a clothes dryer with a switch (or other means) that can be optionally selected by the end user to achieve a lower-power inactive/off mode state than the default inactive/off mode state measured in section 3.5.3 of this appendix, after performing the measurement in section 3.5.3 of this appendix, activate the switch (or other means) to the position resulting in the lowest power consumption and repeat the measurement procedure described in section 3.5.3 of this appendix. Measure and record the lowest inactive/off mode power, P_{lowest} , in watts.

4. * * *

4.1 *Total per-cycle electric dryer energy consumption.* Calculate the total per-cycle electric dryer energy consumption required to achieve a final moisture content of 2 percent or less, E_{ce} , expressed in kilowatt-hours per cycle and defined as:

$$E_{\text{ce}} = E_{\text{t}},$$

for automatic termination control dryers, and,

$$E_{\text{ce}} = [55.5/(\text{IMC} - \text{FMC})] \times E_{\text{t}} \times \text{field use},$$

for timer dryers

Where:

55.5 = an experimentally established value for the percent reduction in the moisture content of the test load during a laboratory test cycle expressed as a percent.

E_t = the energy recorded in section 3.4.5 of this appendix.

field use = 1.18, the field use factor for clothes dryers with time termination control systems only without any automatic termination control functions.

IMC = the moisture content of the wet test load as recorded in section 3.4.2 of this appendix.

FMC = the moisture content of the dry test load as recorded in section 3.4.3 of this appendix.

4.2 Per-cycle gas dryer electrical energy consumption. Calculate the per-cycle gas dryer electrical energy consumption required to achieve a final moisture content of 2 percent or less, E_{ge} , expressed in kilowatt-hours per cycle and defined as:

$$E_{ge} = E_{te},$$

for automatic termination control dryers, and,

$$E_{ge} = [55.5/(IMC - FMC)] \times E_{te} \times \text{field use},$$

for timer dryers

Where:

E_{te} = the energy recorded in section 3.4.6.1 of this appendix.

field use, 55.5, IMC, and FMC as defined in section 4.1 of this appendix.

4.3 Per-cycle gas dryer gas energy consumption. Calculate the per-cycle gas dryer gas energy consumption required to achieve a final moisture content of 2 percent or less, E_{gg} , expressed in Btus per cycle and defined as:

$$E_{gg} = E_{tg} \times GEF$$

for automatic termination control dryers, and,

$$E_{gg} = [55.5/(IMC - FMC)] \times E_{tg} \times \text{field use} \times GEF$$

for timer dryers

Where:

E_{tg} = the energy recorded in section 3.4.6.2 of this appendix.

GEF = corrected gas heat value (Btu per cubic foot) as defined in section 3.4.6.3 of this appendix,

field use, 55.5, IMC, and FMC as defined in section 4.1 of this appendix.

4.4 Total per-cycle gas dryer energy consumption expressed in kilowatt-hours. Calculate the total per-cycle gas dryer energy consumption required to achieve a final moisture content of 2 percent or less, E_{cg} , expressed in kilowatt-hours per cycle and defined as:

$$E_{cg} = E_{ge} + (E_{gg}/3412 \text{ Btu/kWh})$$

Where:

E_{ge} = the energy calculated in section 4.2 of this appendix

E_{gg} = the energy calculated in section 4.3 of this appendix

4.5 Per-cycle standby mode and off mode energy consumption. Calculate the clothes dryer per-cycle standby mode and off mode energy consumption, E_{TSO} , expressed in kilowatt-hours per cycle and defined as:

$$E_{TSO} = [(P_{\text{default}} \times S_{\text{default}}) + (P_{\text{lowest}} \times S_{\text{lowest}})] \times K/C_{\text{annual}}$$

Where:

P_{default} = Default inactive/off mode power, in watts, as measured in section 3.5.3 of this appendix.

P_{lowest} = Lowest inactive/off mode power, in watts, as measured in section 3.5.4 of this appendix for clothes dryer with a switch (or other means) that can be optionally selected by the end user to achieve a lower-power inactive/off mode than the default inactive/off mode; otherwise, $P_{\text{lowest}}=0$.

S_{default} = Annual hours in default inactive/off mode, defined as 8,620 if no optional lowest-power inactive/off mode is available; otherwise 4,310.

S_{lowest} = Annual hours in lowest-power inactive/off mode, defined as 0 if no optional

lowest-power inactive/off mode is available; otherwise 4,310.

K = Conversion factor of watt-hours to kilowatt-hours = 0.001.

C_{annual} = Representative average number of clothes dryer cycles in a year as specified in section 4.5.1.

8,620 = Combined annual hours for inactive and off mode.

4,310 = One-half of the combined annual hours for inactive and off mode.

4.5.1 *Representative average number of clothes dryer cycles in a year.* Per the

Introductory Note:

$$(1) C_{\text{annual}} = 283$$

$$(2) C_{\text{annual}} = 236$$

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